APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR	WM. SAUNDERS, LL.D.
HORTICULTURIST	JOHN CRAIG
CHEMIST	F. T. SHUTT, M.A.
ENTOMOLOGIST and BOTANIST	JAS. FLETCHER, LL.D.
POULTRY MANAGER	A. G. GILBERT
SUPT. EXPERIMENTAL FARM, Nappan, N.S.	GEO. W. FORREST
HORTICULTURIST " " "	W. S. BLAIR
SUPT. EXPERIMENTAL FARM, Brandon, Manitoba	S. A. BEDFORD
" " Indian Head, N.W.T.	ANGUS MACKAY
" " Agassiz, B.C.	THOS. A. SHARPE

FOR

1896 - [1897]

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST
EXCELLENT MAJESTY
1897

[No. 8c—1897.]

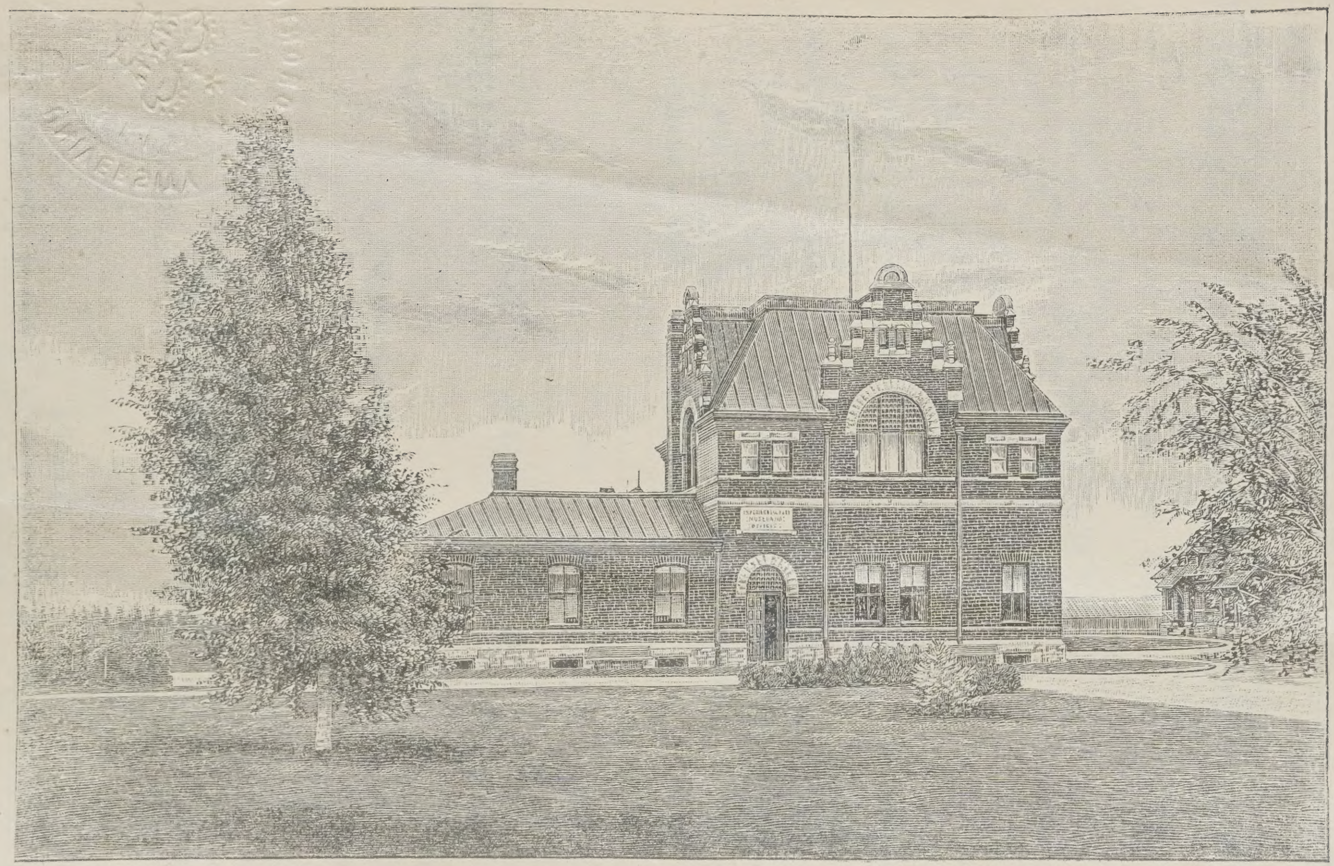


Fig. 1.—Office Building, Museum and Chemical Laboratory of the Central Experimental Farm.

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

---o---

SIR,—I have the honour to submit to you herewith my tenth annual report of work done and in progress at the several experimental farms which have been established in different parts of the Dominion.

You will also find appended reports from the following officers of the Central Experimental Farm: From the Horticulturist Mr. John Craig; from the Chemist, Mr. Frank T. Shutt, and from the Entomologist and Botanist, Dr. James Fletcher. A report is also submitted from the Poultry Manager, Mr. A. G. Gilbert, and from the Foreman of Forestry, Mr. W. T. Macoun; the latter will be found included with the report of the Director.

From the branch experimental farms there are reports from Mr. Geo. W. Forrest, superintendent and from Mr. W. B. Blair, horticulturist of the experimental farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, superintendent of the experimental farm for Manitoba at Brandon; from Mr. Angus Mackay, superintendent of the experimental farm for the North-west Territories, at Indian Head; and from Mr. Thos. A. Sharpe, superintendent of the experimental farm for British Columbia, at Agassiz.

In these reports will be found the results of much carefully conducted experimental work relating to agriculture, horticulture and arboriculture, giving particulars of the outcome of much practical work in the fields, barns, dairy and poultry buildings, orchards and plantations; also of scientific investigation of chemical problems in the laboratory and the careful study of the life history and habits of injurious insects and noxious weeds with suggestions of measures for their destruction. Some details will also be found in the report of the Entomologist and Botanist of the experiments which have been carried on during the past year in connection with bee-keeping.

The large and constantly increasing demand among farmers for the annual reports and bulletins of the experimental farms is a gratifying evidence of the growing desire for information among this class of the community, and of the high esteem in which these records of the work are held. The facts brought together in the present issue will, it is hoped, be found of much practical value to the Canadian farmer and fruit grower and assist materially in the advancement of these industries in this country.

I have the honour to be, sir,
Your obedient servant,

WM. SAUNDERS,
Director.

To the Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS

REPORT OF THE DIRECTOR.

(WM. SAUNDERS, LL.D., F.R.S.C., F.L.S.)

In submitting the tenth Annual Report of the Experimental Farms it seems fitting that some particulars should be presented indicating the progress of the work for the carrying on of which these institutions have been established. The value of enterprises in every sphere of labour is usually estimated by the results obtained, and while in undertakings which are largely educational in their character it is not always possible to demonstrate fully their value from results manifested, enough has been accomplished which can be cited to show that the Experimental Farms have already proved of great service to the farmers of the Dominion.

When in October, 1886, the first step was taken towards the organization of Experimental Farms in Canada by the appointment of the Director, the first work undertaken was a careful study of the climatic and other conditions which influence agriculture in different parts of the country, and to find out where the several farms which it was proposed to establish could be placed so as to confer the greatest benefit on the farmers. The intention was that the sites chosen for these institutions should be so located as to cover the more important climatic conditions prevailing in this country and at the same time minister to the needs of the existing agricultural population. Notwithstanding the keenness of rivalry between different districts contending for the location of these farms in their midst, the fact that no adverse criticism worthy of attention has been attempted, is sufficient evidence that the sites chosen have commended themselves to the judgment of the community.

From the outset every endeavour has been made to help farmers who were striving to gain that experience which would enable them to cope with difficulties, and to carry on their work to better advantage and with increased profits. Of late years the obstacles in the way of profitable farming have been multiplied owing to the low prices for produce and ever increasing competition; amid such pressing difficulties it was imperative that the larger proportion of any work undertaken for the benefit of the farmers of this country should be directed on the practical lines of better methods of farming, and the testing and introduction of such vigorous, productive and early maturing varieties of the more important cereals as would be likely to result in increased crops and higher quality in the product. To attain the object first named practical information has been given in regard to the best methods of maintaining the fertility of the soil and of renewing the cropping capabilities of land which has been partially exhausted. The proper care of barn-yard manure has been discussed and the

effects of fertilizers on various crops demonstrated, also the best methods of preparing the soil to receive the seed, the most successful methods of sowing, the quantity of seed to be used and the depth in the soil to which it may be placed to the greatest advantage. Long courses of experiments have also been conducted to demonstrate the best time for sowing the more important crops in the different climates of the Dominion.

To accomplish the ends sought in the second line of work mentioned, suitable varieties of grain and other products have been sought for in every accessible country where climatic difficulties exist similar to our own. To add to the chances of success the art of cross-fertilizing has been practised with the object of combining the good qualities of existing varieties in the progeny thus produced. Although the time has been short, a gratifying measure of success has attended the efforts which have been made, our farmers have been aroused to an intelligent interest in this work and new and more prolific strains of seed are fast taking the places of some of the less valuable sorts heretofore grown. A great impetus has been given to this special branch by the judicious and free distribution in sample lots of all the surplus grain of the best varieties produced at all the experimental farms.

The object lessons which have been given in the raising of fodder crops and the converting of these into ensilage, thus providing succulent food for cattle during the winter have greatly stimulated the dairy industry, especially the manufacture of butter in winter, also the economical fattening of steers, thus affording more profitable employment for farm labour during the winter months. The experiments which have been conducted in reference to the economical production of butter of the highest quality and the best management of milk to secure the most complete separation of the butter fat have commanded much attention from those engaged in this special industry. The demonstrations which have been made by the feeding of swine with the coarser and inferior cereals and the otherwise waste products of the farm and converting these into pork has stimulated and enlarged the swine industry. The business in eggs and dressed fowls for the table has also been advanced by the publication of results obtained from experiments in the poultry branch of the experimental farm work.

The difficulties which settlers experience in the more remote portions of the Dominion where the climatic extremes are greater, have also been carefully considered and means devised for their benefit. Many experiments have been made in the treatment of the soil with the view of conserving moisture, also in the introduction of suitable fodder crops and grasses. To the experimental farms are due the credit of the introduction into the Canadian North-west of the Awnless Brome Grass (*Bromus inermis*) and of demonstrating its value both for hay and pasture, thus supplying a want which stood much in the way of successful cattle raising and dairying. The general cultivation of this useful grass which endures severe drought and intense cold with impunity, gives early and succulent green food and large crops of nutritious hay, is preparing the way for a vast extension of the cattle trade and also of the butter and cheese industries.

The instructive experiments which have been carried on in the testing of many varieties of large and small fruits have served to show where these can be grown to advantage and by skilful cross-fertilization on hardy wild forms new and improved sorts are being produced, some of which will, it is believed, prove useful as well as hardy enough to eventually furnish the settlers throughout the North-west country with some of those healthful and agreeable luxuries which nature has given with such a liberal hand to those who dwell in those portions of the country where the climate is more genial. The information which has been given on the cultivation of vegetables and the varieties best suited to the different climates of the country has proved of much value, while the encouragement given to the growing of trees for shelter and ornament, and the stimulus afforded by the example shown and by limited distributions of seeds and cuttings to those who desire to improve their surroundings by the planting of trees and shrubs has had the effect of making many a wilderness blossom and of converting bare and and uninviting surroundings into attractive and sheltered homes.

The practical and much appreciated help which has been rendered by the officers who have special charge of the more scientific branches of the work has also been a

source of satisfaction to the public. The information given as to the best remedies for the destruction of noxious insects and for resisting the inroads made by fungous diseases from which grain, fruit and other crops have suffered much in the past has been much appreciated and the good results obtained from the use of the measures recommended have been very satisfactory to farmers and fruit growers. The subject of noxious weeds has also received much consideration and the best measures pointed out for their subjugation.

Investigations have been made regarding the nutritious constituents in many fodder plants which have been analysed at different stages of their growth to determine the period when these plants may be cut to the greatest advantage. Much valuable information has thus been given to the farmers of Canada from which they have greatly profited. In other lines of chemical research many useful facts have been published, regarding the action of manures, the usefulness of mucks, muds and marls as fertilizing agents, also on the composition of soils in different parts of the Dominion. Much work has also been done by the chemist of the Experimental Farms in determining the quality of well waters used by farmers, and in many instances, existing impurities have been pointed out and thus the dangerous results which so often follow the use of polluted water have in large measure been prevented.

Much information is given each year by all the officers of the staff to the ever increasing number of correspondents, and a still larger circle of farmers receive the reports and bulletins published by the Experimental Farms containing the results obtained from the work in progress in all its branches. Judging from the commendatory letters received the aid thus rendered to the farming community is very much appreciated.

In this brief summary reference has only been made to some of the more prominent features of the work which has been done by the experimental farms during the few years which have elapsed since they were established. The attempt has been made and with much success to carry on useful lines of work in every important branch of agriculture, horticulture and arboriculture, and while the chief aim has been to advance the interests of farming and to make that noble occupation more profitable, other important objects have not been overlooked, encouragement has been given to the cultivation and dissemination of fruits and vines, as well as to the planting of trees, shrubs and flowers so that our people both in town and country might enjoy the healthful luxury of such fruits as our climate will afford and at the same time surround themselves with objects of beauty the study and observance of which will refine their minds and add quiet enjoyment to their lives.

EXPERIMENTS WITH OATS.

The oat is one of the most widely cultivated of cereals. It has been grown by man as food for himself and his domesticated animals for more than a thousand years. There are many species of wild oats found in different parts of the world, but from which of these the cultivated oat has been derived is still a matter of conjecture. De

FIG 2.—Branching Oat, American Beauty—half natural size.

Candolle advances the opinion that our cultivated forms of this useful grain have probably been derived from some prehistoric form, a native of eastern temperate Europe and of Tartary.

Whatever may have been its source the great usefulness of the oat to man has led to its cultivation on a most extensive scale in almost every country. In Canada it covers a very wide acreage. In the province of Ontario alone 2,425,107 acres was devoted to this crop in 1896, and the total yield of grain was nearly 83 million bushels.

The land occupied by oats in this province was nearly equal to the acreage devoted to all the other cereals combined. There are many varieties of oats in cultivation and some of them are much more vigorous and productive than others. One distinguishing feature is that of colour, some being black others tawny or yellow, but the greater part are white. These are further distinguished by the way in which the heads or panicles are formed. Until recent years only the branching and sided varieties were known, but now there are intermediate forms. In figure 2, we have a representation of a branching

Fig. 3.—Half branching Oat, Oderbruch half natural size.

Fig. 4.—Sided or mane oat Giant Cluster—half natural size.

oat known as the American Beauty. Many of the most productive sorts belong to this class, viz., the Banner, Improved American, Holstein Prolific, Improved Ligowo, Golden Beauty, Columbus, Wallis, American Triumph and Bavarian. Figure 3, represents the Oderbruch which is a half branching variety; the Early Gothland is another example of this class.

In figure 4, is shown a "Sided" or "Mane" variety know as the Giant Cluster; other familiar examples of this form are the Golden Giant and the Black Tartarian. An intermediate form is seen in figure 5, which is known as half sided and represents

one of the new cross-bred varieties named Russell, which is a cross between the Prize Cluster, a branching variety and the Giant Cluster one of those with a sided head. Much the larger proportion of the more prolific sorts belong to the branching oats represented in figure 2.

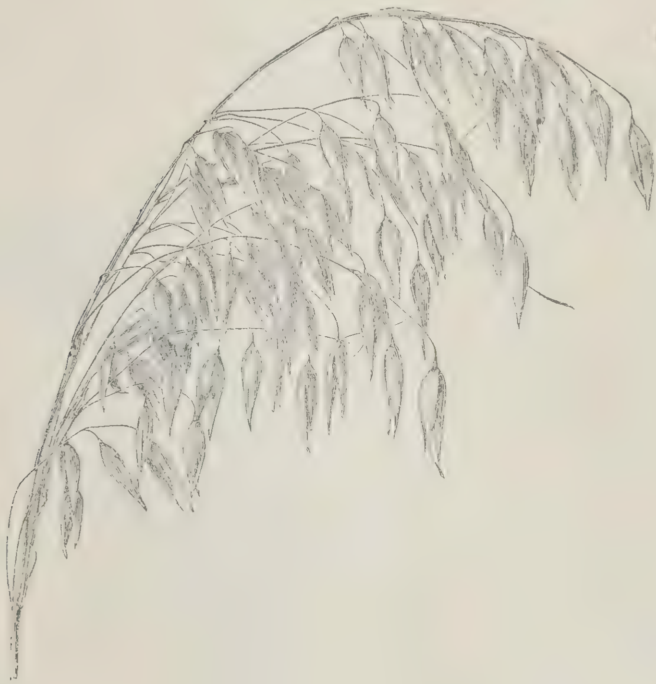


FIG. 5.—Half sided Oat, Russell, half natural size.

UNIFORM TEST PLOTS OF OATS.

During the season of 1896, fifty-nine varieties of oats have been tested under fairly uniform conditions, to gain information regarding their relative yield, earliness and other qualities. They were all sown on the 30th April and 1st May, on plots of $\frac{1}{20}$ acre each. The soil was a clay loam of fair quality which was manured in the spring of 1891, with about 20 tons of barn-yard manure per acre. It also received an application of about 150 bushels of unleached wood ashes per acre, in the autumn of 1893. No fertilizers have been applied since. The previous crop was barley. The land was ploughed soon after harvest with the gang plough about two inches deep and harrowed with the smoothing harrow to cover and germinate weed seeds and shed grain, and later in the autumn it was ploughed about eight inches deep. In the spring of 1896, the land was disc-harrowed twice and harrowed with the smoothing harrow before sowing. In figure 6 a view is given of these uniform test plots at the time of harvest.

View of the uniform test plots of grain at the Central Experimental Farm, Ottawa.

OATS—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.		No. of days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per bushel.	Rusted.
				Inches.	Inches.		Bush.	lbs.	Lbs.	
Banner	Aug.	3	94	48 to 51	8 to 10	Branching	85	10	35½	Slightly.
Improved American	do	5	97	51 to 60	9 to 11	do	83	18	35	Considerably.
Golden Beauty	do	2	93	48 to 55	8 to 10	do	80	—	35¾	Slightly.
American Triumph	do	4	95	53 to 59	9 to 10	do	78	18	34½	Considerably.
Columbus	do	1	92	44 to 54	8 to 10	do	77	2	35	Slightly.
White Russian	do	2	94	55 to 63	8 to 10	do	76	6	34	Badly.
Holstein Prolific	July	31	91	44 to 54	8 to 10	do	76	6	35	Considerably.
Mennonite	Aug.	1	92	48 to 54	8 to 10	do	75	30	34¾	Slightly.
Golden Giant	do	10	101	46 to 52	10 to 12	Sided	74	24	31¾	Considerably.
Brandon	do	3	94	55 to 63	10 to 12	Branching & half sided	73	28	38	do
Hazlett's Seizure	do	1	93	51 to 60	9 to 11	Branching	73	18	37¾	Badly.
Bavarian	do	3	94	48 to 57	9 to 10	do	72	22	34½	Slightly.
Abundance	do	1	92	48 to 53	8 to 9½	do	72	12	36	do
Buckbee's Illinois	do	3	94	45 to 58	9 to 11	do	72	12	36¾	do
Giant Cluster	do	10	101	46 to 54	10 to 12	Sided	71	26	31¾	Considerably.
Improved Ligowo	July	28	89	36 to 48	8	Branching	71	16	36¾	Slightly.
Early Archangel	do	29	89	48 to 56	9 to 11	do	71	16	41¼	do
Doncaster Prize	Aug.	11	102	48 to 60	9 to 10	do	71	6	36¼	Badly.
Oderbruch	do	3	95	46 to 58	....	H'f branch'g	70	20	38	Considerably.
Russell	do	4	95	56 to 63	....	do	70	20	33¼	do
American Beauty	do	1	92	44 to 51	8 to 10	Branching	69	14	35¼	Slightly.
Rennie's Prize White	July	29	89	58 to 64	9 to 11	do	68	8	39	do
Flying Scotchman	do	30	90	48 to 57	8 to 10	do	68	8	36¼	Considerably.
Early Gothland	Aug.	3	94	48 to 58	8 to 9½	Half sided	68	8	39½	Slightly.
Cromwell	do	3	94	53 to 60	10 to 12	Branching & half sided.	68	8	36¼	do
White Schonen	do	1	93	43 to 52	8 to 11	Branching	66	6	35	do
Pense	do	5	96	51 to 58	9 to 12	Sided & half sided	65	30	34¼	Badly.
Lincoln	do	4	95	48 to 58	8 to 10	Branching	65	20	35½	Slightly.
Early Golden Prolific	do	5	96	51 to 61	8 to 10	do	64	24	34	Considerably.
Wallis	do	1	92	42 to 48	8 to 10	do	62	32	35	Slightly.
Welcome	July	28	89	57 to 63	10 to 12	do	62	12	39¾	do
Miller	Aug.	5	96	41 to 48	7 to 10	do	62	12	35½	Considerably.
Cream Egyptian	do	3	94	48 to 58	8 to 9½	Half sided	61	26	39¼	do
Abyssinia	do	3	95	46 to 58	8 to 9½	do	61	6	39	do
Master	do	3	94	48 to 60	10 to 12	Branching & half-sided.	61	6	35¼	do
Joanette	do	5	96	36 to 43	7 to 8	Branching	60	30	35½	Slightly.
Early Etampes	do	5	96	36 to 42	7 to 8	do	60	30	35½	do
Rosedale	do	3	94	51 to 54	8 to 9½	Half-sided	60	20	37	Considerably.
Victoria Prize	July	27	88	58 to 63	10 to 11½	Branching	60		38½	do
Poland	do	31	92	45 to 54	8 to 10	do	60		37¼	Slightly.
Scotch Hopetoun	Aug.	13	105	42 to 56	9 to 10	do	60		32½	Badly.
Bonanza	July	27	88	56 to 63	10 to 11½	do	59	24	38¾	Considerably.
Oxford	Aug.	4	95	52 to 63	10 to 13	Branching & half-sided.	59	24	35½	do
Winter Grey	July	27	88	48 to 60	9 to 11	Branching	59	14	40	do
Prize Cluster	do	30	101	57 to 66	9 to 11	do	58	28	40	Badly.
King	Aug.	8	99	41 to 48	7 to 10	do	58	8	33¼	Considerably.
Medal	do	3	94	55 to 63	10 to 12	Branching & half-sided.	57	22	36½	do
Scottish Chief	July	27	88	48 to 58	9 to 11	Branching	56	11	38¼	Slightly.
Imported Irish	do	27	88	49 to 54	10 to 11½	do	56	6	41	do
White Wonder	do	28	89	50 to 60	9 to 12	do	56	6	37¼	Considerably.
Early Maine	Aug.	5	96	46 to 56	9 to 11	do	55	10	33¾	Badly.
Siberian	do	7	98	48 to 56	9 to 10	Sided.	55		32¼	Slightly.
Wide Awake	July	31	92	42 to 54	8 to 9	Branching	54	4	37	do
White Monarch	Aug.	10	102	45 to 53	8 to 9	do	52	32	38	Badly.
Prolific Black Tartarian	do	5	97	51 to 58	9 to 10	Sided	52	2	28¾	do
Olive	do	7	98	48 to 54	9 to 11	Sided & half-sided	49	14	35¼	Considerably.
Coulommiers	do	13	105	46 to 54	9 to 10	Branching	47	32	33¾	Badly.
Early Blossom (soil poor)	do	5	96	34 to 50	8 to 9	Half-sided	45	30	36¼	do
California Prolific Black	do	5	96	48 to 58	8 to 9	Sided,	45	10	33¼	Considerably.

There are included in the preceding list ten of the new cross-bred sorts which have been produced at the experimental farms. The following are their names and parentage.

Brandon	Giant Cluster	female, with	Prize Cluster	male.
Russell	Prize Cluster	do	"	Giant Cluster	do
Cromwell	Prize Cluster	do	"	Giant Cluster	do
Pense	Black Tartarian	do	"	Early Gothland	do
Miller	Banner	do	"	Doncaster Prize	do
Master	Prize Cluster	do	"	Giant Cluster	do
Oxford	Giant Cluster	do	"	Prize Cluster	do
King	Banner	do	"	Doncaster Prize	do
Medal	Prize Cluster	do	"	Giant Cluster	do
Olive	Black Tartarian	do	"	Early Gothland	do

These are all the results of special work done in cross-fertilizing with the varieties named at Brandon in 1892, by Dr. A. P. Saunders. The single kernels thus obtained were sown in the spring of 1893 at the central farm and multiplied there until the spring of 1896, when they were first sent out for test at the branch farms.

There were several objects in view in making these crosses. One was to endeavour to start in this way new and vigorous strains of productive sorts, others were to ascertain the effect of crossing sided oats with branching, thin hulled oats with thick hulled, oats with long kernels with others with short kernels, yellow oats with white, and black oats with white. Many interesting results in the way of intermediate forms have been obtained, but some of these will need to be selected probably for several years to come before uniformity of character in the grain is secured.

Siberian Oats.

It has for several years past been a matter of surprise that the Siberian oat grown by the experimentalist on the college Farm at Guelph, Ontario, has given uniformly much better crops than the oat grown under the same name at Ottawa. Through the kind courtesy of Mr. C. A. Zavitz, the Central Experimental Farm was supplied last season with enough of the seed of the Siberian oat grown at Guelph to sow a plot of 1-20th of an acre. As this seed was not received early enough to be included in the uniform test plots, it was sown separately, and proved to be very productive and gave a crop equal to 82 bush. 12 lbs. per acre, but it was a branching oat, whereas the Siberian which has been grown at Ottawa is a sided variety. The seed used at the central farm is from an importation made in 1888 from Haage & Schmidt, the well known seedsmen of Erfurt, Germany, while the Siberian oat grown at Guelph was supplied by an English seed firm. These oats are distinct varieties, and the Guelph seed has thus far been the most productive, but which of them is the true Siberian has not yet been determined.

TREATMENT OF OATS FOR SMUT.

Smut has occurred to a greater or less extent in some varieties of oats at the Central Farm for several years past, and in some instances the crops obtained from the experimental plots have been materially reduced from this cause. With the object of preventing the recurrence of such loss all the varieties, which had suffered in the past have been treated this year with a solution of potassium sulphide as follows :—

Dissolve $1\frac{1}{2}$ lbs. of potassium sulphide in 25 gallons of cold water and soak the oats in this solution for 24 hours. Drain off the liquid and spread the oats thinly in some suitable place where they will dry quickly and sow the following day. If the seed thus treated is not dried quickly it is liable to sprout before sowing. In every instance where the seed was thus treated the grain was practically free from smut.

The following varieties were sown with seed both treated and untreated, and the heads growing on 33 square feet were counted with the following results :—

Name of variety.	Treated.		Untreated.	
	No. of good heads.	No. of heads smutted.	No. of good heads.	No. of heads smutted.
Flying Scotchman	1,407	None.	1,424	167
Doncaster Prize	1,479	4	1,067	352
Rennie's Prize	1,516	4	1,656	138

FIELD CROPS OF OATS.

Abundance.—4¾ acres. Sown on light sandy loam. The land was manured in the spring of 1893 with 18 to 20 tons of barn-yard manure per acre, and cropped in 1895, 3 acres with pease and 1¾ acres with potatoes. That part on which the pease were sown was ploughed in the autumn about 8 inches deep and disc-harrowed twice in the spring and harrowed with the smoothing harrow twice before sowing. That part on which the potatoes were grown in 1895 was manured in the spring of 1893 with 18 to 20 tons of barn-yard manure per acre. It was ploughed in the spring of 1896, about 6 inches deep and harrowed with the smoothing harrow twice before sowing. Sown 24th April; two bushels per acre; came up 4th May, and was ripe 31st July. The time to mature was 98 days. The yield per acre was 57 bushels 24 lbs.; weight per bushel, 35 lbs. Length of head, 8 to 11 inches, branching; length of straw, 40 to 55 inches. Made a fairly strong growth; all standing well; no smut; leaves and stems slightly rusted.

Wallis.—9 acres. Sown on light sandy loam which was manured in the spring of 1895, with 12 tons of barnyard manure per acre. The previous crop was corn. The land was ploughed in the autumn of 1895, about 8 inches deep and disc-harrowed twice and twice harrowed with the smoothing harrow before sowing. Sown 6th May: two bushels per acre; came up 11th May, and was ripe 8th August. The time to mature was 94 days. The yield per acre was 37 bushels 13 lbs.; weight per bushel 35¾ lbs. Length of head, 7 to 9 inches, branching; length of straw, 40 to 52 inches; all standing well; growth medium; rather uneven; no smut; leaves and stems slightly rusted. The crop was light owing to the poor quality of the soil.

Golden Beauty.—1 acre. Sown on heavy sandy loam. The land was manured in the spring of 1895 with about 10 tons of barn-yard manure per acre. The previous crop was corn and beans. It was ploughed late in the autumn of 1895 about 8 inches deep and disc-harrowed twice in the spring of 1896 and harrowed with the smoothing harrow twice before sowing. Sown 6th May; two bushels per acre; came up 13th May, and was ripe 6th August. The time to mature was 92 days. The yield per acre was 56 bushels 6 lbs.; weight per bushel 39¾ lbs. Length of head, 7 to 9 inches, branching; length of straw, 46 to 50 inches; all standing well; made a strong, even growth. There was some smut and the leaves and stems were slightly rusted.

The four following plots were sown adjoining Golden Beauty, on similar land, which had the same manuring and treatment :—

Columbus.—¾ acre. Sown 6th May; two bushels per acre; came up 12th May, and was ripe 5th August. The time to mature was 91 days. Yield per acre, 67 bushels 30 lbs.; weight per bushel 35¼ lbs. Length of head, 7 to 9 inches, branching; length of straw 46 to 48 inches; all standing well; growth strong and even; no smut; leaves and stems slightly rusted.

American Beauty.—¾ acre. Sown 6th May; two bushels per acre; came up 12th May, and was ripe 6th August. The time to mature was 92 days. Yield per acre, 74 bushels 11 lbs.; weight per bushel 38½ lbs. Length of head, 7 to 9 inches, branch-

ing; length of straw, 41 to 48 inches; all standing well; growth strong and even; very little smut; leaves and stems ver y slightly rusted.

Improved Ligowo.—$\frac{3}{4}$ acre. Sown 6th May; two bushels per acre; came up 12th May, and was ripe 5th August. The time to mature was 91 days. Yield per acre, 70 bushels 15 lbs.; weight per bushel 39$\frac{1}{2}$ lbs. Length of head, 8 to 10 inches, branching; length of straw, 46 to 52 inches; all standing well; growth very strong and even; no smut, and very slightly rusted.

Joanette.—1$\frac{1}{2}$ acres. Sown 6th May; one and three-quarter bushels per acre; came up 14th May, and was ripe 8th August. The time to mature was 94 days. Yield per acre, 62 bushels 22 lbs.; weight per bushel, 34$\frac{1}{4}$ lbs. Length of head, 6 to 8 inches, branching; length of straw, 37 to 43 inches; all standing well; growth medium; no smut; leaves and stems very slightly rusted.

Early Gothland.—4 acres. Sown on heavy sandy loam. This land was in pasture since 1889 and has had no manure. It was ploughed in the spring of 1895 and cropped with corn and beans that year. It was ploughed in the autum of 1895 about 8 inches deep and disc-harrowed twice the following spring and harrowed with the smoothing harrow twice before sowing. Sown 7th May; 1$\frac{1}{2}$ bushels per acre; came up 12th May, and was ripe 7th August. The time to mature was 92 days. Yield per acre, 60 bushels 4 lbs.; weight per bushel 40 lbs. Length of head, 6 to 8 inches; half sided; length of straw, 46 to 56 inches; standing fairly well—a few spots lodged; growth very strong and even; a few heads of smut; leaves and stems very slightly rusted.

Banner.—1$\frac{3}{4}$ acres. Soil a heavy sandy loam. The land was manured during the winter of 1895-96 with about 12 tons of barn-yard manure per acre, placed in small heaps of about half a cart load each and spread and ploughed under in the spring; then harrowed with the smoothing harrow twice before sowing. Sown 9th May; 2 bushels per acre; came up 14th May, and was ripe 10th August. The time to mature was 93 days. Yield per acre, 64 bushels 13 lbs; weight per bushel 34 lbs. Length of head, 8 to 10 inches, branching; length of straw, 55 to 61 inches; growth very strong and even; standing fairly well, a few small spots lodged; no smut; leaves and stems slightly rusted.

Another field of the Banner was grown, measuring 10 acres. Soil a light sandy loam, which was manured with from 15 to 18 tons of barn-yard manure per acre, in the spring of 1894. It was ploughed late in the autumn of 1895 and disc-harrowed twice in the spring of 1896 and harrowed with the smoothing harrow twice before sowing. Sown 9th May: 2 bushels per acre; came up 16th May, and was ripe 12th August. The time to mature was 95 days. Yield per acre, 47 bushels 16 lbs.; weight per bushel 34 lbs. Length of head, 7 to 10 inches, branching; length of straw, 45 to 51 inches. Made a strong, even growth; standing well; very little smut; leaves and stems very slightly rusted.

Rosedale.—3 acres. This plot was almost adjoining the Banner, on similar light soil, which received the same manuring as the Banner, but the manure was applied during the winter of 1894-95, and ploughed under in the spring, after which the land was twice harrowed with the smoothing harrow before sowing. Sown 9th May; 1$\frac{3}{4}$ bushels per acre; came up 15th May, and was ripe 10th August. The time to mature was 93 days. Yield per acre, 59 bushels 25 lbs.; weight per bushel, 38 lbs. Length of head, 7 to 10 inches; half sided; length of straw, 43 to 48 inches; all standing well; growth strong and even; no smut; leaves and stems considerably rusted.

Bavarian.—8 acres. Soil a light sandy loam, a small proportion of it peaty. The land was manured during the spring of 1895, the manure being placed out during the winter, in small piles of about half a cart load each; and spread in the spring; the previous crop was oats. It was ploughed in the autumn of 1895 about 8 inches deep and disc-harrowed twice in the spring of 1896 and harrowed with the smoothing harrow twice before sowing. Sown 9th May; 1$\frac{3}{4}$ bushels per acre; came up 19th May, and was ripe 12th August. The time to mature was 95 days. Yield per acre, 46 bushels 17 lbs.; weight per bushel, 32$\frac{3}{4}$ lbs. Length of head, 7 to 10 inches, branching; length of straw, 45 to 51 inches; growth strong and even; all standing well; no smut; leaves and stems very slightly rusted.

Golden Giant Side.—5 acres. This plot was adjoining the Bavarian, and the soil, which was all light sandy loam, received the same manuring and treatment. Sown 12th May; 2 bushels per acre; came up 17th May, and was ripe 15th August. The time to mature was 95 days. Yield per acre, 48 bushels 2 lbs.; weight per bushel 36 lbs. Length of head, 7 to 9 inches; sided; length of straw, 43 to 51 inches; all standing well; growth strong and even; no smut; leaves and stems slightly rusted.

Winter Grey.—$3\frac{3}{4}$ acres.—This plot also adjoined the Bavarian oats, and received the same manuring and treatment, but the soil was all peaty. Sown 13th May; $1\frac{3}{4}$ bushels per acre; came up 18th May, and was ripe 11th August. The time to mature was 90 days. Yield per acre, 29 bushels 25 lbs.; weight per bushel, 41 lbs.; length of head, 7 to 9 inches, branching; length of straw, 38 to 44 inches; standing fairly well; growth medium and even; no smut; leaves and stems slightly rusted. This soil being unsuitable for the crop, the yield was comparatively small.

The six varieties following were all sown on one-acre plots side by side. The land was all similar in quality, and the manuring and treatment was the same.

Oderbruch.—1 acre.—Sown on heavy sandy loam. The land was manured in the spring of 1895 with about eight tons of barn-yard manure per acre; previous crop was mixed grain. It was ploughed in the spring of 1896 about 6 inches deep and harrowed with the smoothing harrow before sowing. Sown 14th May; $1\frac{3}{4}$ bushels per acre; came up 21st May, and was ripe 15th August. The time to mature was 93 days. Yield per acre, 33 bushels 20 lbs.; weight per bushel, 31 lbs; length of head, 7 to 9 inches, sided; length of straw, 41 to 49 inches; all standing well; growth strong and even; no smut; leaves and stems slightly rusted.

Siberian.—1 acre.—Sown 14th May; $1\frac{3}{4}$ bushels per acre; came up 21st May, and was ripe 15th August. The time to mature was 93 days. Yield per acre, 37 bushels 13 lbs.; weight per bushel, 35 lbs. Length of head, 8 to 10 inches, sided; length of straw, 44 to 51 inches; all standing well; growth strong and even; no smut; leaves and stems slightly rusted.

Victoria Prize.—1 acre. Sown 14th May; $1\frac{3}{4}$ bushels per acre; came up 21st May, and was ripe 8th August. The time to mature was 86 days. Yield per acre, 33 bushels 5 lbs.; weight per bushel, 33 lbs. Length of head, 8 to 10 inches, branching; length of straw, 45 to 49 inches; was somewhat broken just before harvesting; growth strong and even; a little smut; leaves and stems slightly rusted.

Flying Scotchman.—1 acre. Sown 14th May; $1\frac{3}{4}$ bushels per acre; came up 21st May, and was ripe 7th August. The time to mature was 85 days. Yield per acre, 34 bushels 3 lbs.; weight per bushel, $37\frac{1}{4}$ lbs. Length of head, 7 to 9 inches, branching; length of straw, 41 to 47 inches; considerably lodged; growth strong and even; a little smut; leaves and stems slightly rusted.

Early Golden Prolific.—1 acre. Sown 14th May; $1\frac{3}{4}$ bushels per acre; came up 21st May, and was ripe 10th August. The time to mature was 90 days. Yield per acre, 44 bushels 3 lbs.; weight per bushel, $35\frac{1}{4}$ lbs. Length of head, 7 to 9 inches, branching; length of straw, 41 to 47 inches; all standing well; growth strong and even; a little smut; leaves and stems slightly rusted.

Prize Cluster.—1 acre. Sown 14th May; $1\frac{3}{4}$ bushels per acre; came up 21st May, and was ripe 10th August. The time to mature was 90 days. Yield yer acre, 32 bushels 4 lbs.; weight per bushel, $38\frac{1}{4}$ lbs; length of head, 8 to 10 inches branching; length of straw, 44 to 49 inches; all standing well; growth strong and even; some smut; leaves and stems slightly rusted.

EXPERIMENTS WITH BARLEY.

Comparative tests have been made during 1896 with fifty-seven varieties of barley, twenty-eight of which were two-rowed sorts and twenty-nine were six-rowed. These were all sown in plots of $\frac{1}{20}$ acre each. The two-rowed varieties were all sown on the 5th of May, and the six-rowed on the 4th and 5th of May. The soil was a heavy sandy loam which was manured in the spring of 1896 with about twelve tons of barn-yard

manure per acre, the manure being placed on the land during the winter in small piles of about half a cartload each and spread in the spring. This manure was ploughed under in the spring about six inches deep and harrowed twice with the smoothing harrow before sowing. The land had received no manure or other fertilizer since the spring of 1892, the previous crop was horse beans.

TWO-ROWED BARLEY—TEST OF VARIETIES.

Name of Variety.	Date of ripening	No. of days maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per acre.		Weight per bushel.	Rusted.
			Inches.		Inches.	Bush.	Lbs.		
Bolton	Aug. 7.	91	48	Medium	3¾ to 5	51	2	52	Slightly.
Newton	do 7.	94	48 to 52	Fair	3 to 3½	51	2	51	Very slightly.
Danish Chevalier	do 9.	96	42 to 54	Stiff	4 to 5	50	10	49	do
Canadian Thorpe	do 7.	94	48 to 55	Fair	3 to 3½	49	28	50¾	do
Kinver Chevalier	do 8.	95	48 to 54	Weak	4½ to 5½	49	8	49¼	do
Pacer	do 4.	91	48	Medium	3 to 4	48	6	52	Slightly.
Logan	do 1.	88	48 to 60	Stiff	2¾ to 4½	47	44	51	Very slightly.
Victor	do 4.	91	48	Medium	3 to 4½	46	32	51½	do
Leslie	do 1.	88	48 to 52	Stiff	3 to 4	46	27	52	do
Douglas	do 7.	94	48 to 56	Medium	2¼ to 4	46	12	46¾	do
Sidney	do 3.	90	48 to 52	do	3 to 4½	46	12	50¾	do
Dunham	do 1.	88	48 to 58	Fair	2¾ to 4	46	7	50½	do
French Chevalier	do 10.	97	42 to 54	Weak	3½ to 5	45	40	48¾	do
Nepean	do 4.	91	48 to 58	Fair	3½ to 4½	45	30	52	do
Kirby	do 1.	88	42 to 48	Medium	3 to 4½	45	30	51	do
Jarvis	do 5.	92	48 to 56	Stiff	3 to 5	45	5	50½	do
Suffolk Coast Chevalier, No. 1	do 7.	94	48	Weak	3½ to 4½	44	38	48¾	do
Thanet	do 8.	95	45 to 51	do	4 to 5	44	28	48	do
Beaver	do 7.	94	44 to 48	Fair	3 to 4	44	8	51¼	do
Suffolk Coast Chevalier No. 2	do 7.	94	44 to 48	do	4 to 5	44	8	49¼	do
Prize Prolific	do 8.	95	48 to 52	Weak	4 to 5	41	42	46¾	do
Prolific (Wrinch)	do 7.	94	42 to 48	do	3½ to 4½	40	40	48½	do
Duck-bill	do 7.	94	48 to 54	Stiff	2¾ to 3¼	39	28	49¾	do
California Prolific	do 7.	94	46 to 52	Fair	3 to 3½	39	28	51¼	do
Gordon	do 1.	88	51 to 60	Stiff	2¾ to 4½	38	36	52	do
Harvey	do 3.	90	52 to 60	Medium	2¾ to 4½	38	31	50½	do
Monck	do 8.	95	51 to 55	do	3½ to 4½	36	42	51¼	Slightly.
Rigid	do 8.	95	48 to 55	do	3 to 3½	34	38	50¾	do

In the foregoing list of two-rowed varieties there are thirteen new hybrid sorts which have been produced at the experimental farms. The following are the names and parentage of these new forms:

1. Bolton—Swedish (two-rowed) .... Female Baxters (six-rowed) .... Male
2. Pacer—Swedish (two-rowed) .... do Baxter's (six-rowed) .... do
3. Logan—Baxter's (six-rowed) .... do Duck-bill (two-rowed) ...... do
4. Victor—Swedish (two-rowed) .... do Baxter's (six-rowed) .... do
5. Leslie—Rennie's Improved (six-rowed) ... do Duck-bill (two-rowed) ..... do
6. Sidney—Swedish (two-rowed) .... do Baxter's (six-rowed) .... do
7. Dunham—Duck-bill (two-rowed) .... do Rennie's Imp. (six-rowed) .. do
8. Nepean—Swedish (two-rowed) .... do Baxter's (six-rowed) .... do
9. Kirby—Rennie's Improved (six-rowed) ... do Duck-bill (two-rowed) ..... do
10. Jarvis—(four-rowed) .... do Canadian Thorpe (two-rowed) do
11. Beaver—Swedish (two-rowed) .... do Baxter's (six-rowed) .... do
12. Gordon—Baxter's (six-rowed) .... do Duck-bill (two-rowed) ..... do
13. Harvey—Rennie's Improved (six-rowed)... do Duck-bill (two-rowed) ..... do

Of these results in hybridising Nos. 1, 2, 4, 6, 8 and 11 were the work of the Director at the Central Farm in 1889, Nos. 3, 10 and 12 that of Mr. W. T. Macoun at

the Central Farm in 1892, and Nos. 5, 7, 9 and 13 that of Dr. A. P. Saunders at the branch farm at Agassiz in 1892. All these have been carefully watched and selected ever since they were originated, all six-rowed sports have been rejected and the types of most of them are now fairly well fixed.

The chief objects in view in producing these hybrids of two-rowed and six rowed barley were to endeavour to add to the list of vigorous and productive sorts, to bring about earlier ripening in the two-rowed varieties and longer heads with a greater propensity to stooling in the six-rowed sorts which would probably bring larger crops.

FIELD CROP OF TWO-ROWED BARLEY.

Canadian Thorpe.—Three acres. Sown on light sandy loam. The land received a light dressing of barn-yard manure—about 10 tons per acre—in the spring of 1896; was previously manured in the spring of 1895 with 8 tons of barn-yard manure per acre; the previous crop was corn. The land was ploughed in the spring of 1896 about 6 inches deep and harrowed with the smoothing harrow before sowing. Sown 5th May; 2 bushels per acre; came up 11th and 12th May, and was ripe 6th August. The time to mature was 93 days. Yield per acre, 30 bushels 6 lbs; weight per bushel, $52\frac{3}{4}$ lbs. Length of head $2\frac{1}{2}$ to $3\frac{1}{4}$ inches; two-rowed; length of straw, 33 to 38 inches; all standing well; growth medium and somewhat uneven; some smut; leaves and stems slightly rusted.

SIX-ROWED BARLEY—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
			Inches.		Inches.	Bush.	Lbs.	Lbs	
Odessa	July 29..	86	46 to 50	Fair	$2\frac{1}{2}$ to 3	69	8	49	None.
Royal	do 29..	86	41 to 46	do	$2\frac{3}{4}$ to 3	62	4	$48\frac{1}{2}$	Slightly.
Champion	do 26..	82	50 to 54	do	$2\frac{1}{2}$ to 3	61	12	$42\frac{1}{2}$	None.
Mensury	do 30..	87	48 to 54	do	3 to 4	61	2	$47\frac{1}{2}$	Very slightly.
Baxter's	do 26.	83	48 to 52	do	$2\frac{1}{4}$ to $2\frac{3}{4}$	60		$46\frac{1}{4}$	Slightly.
Trooper	do 29..	85	39 to 44	Stiff	2 to 3	58	46	$49\frac{3}{4}$	do
Summit	do 29..	86	36 to 46	Fair	$2\frac{1}{4}$ to 3	58	46	51	None.
Phœnix	do 25..	82	42 to 48	do	2 to $2\frac{3}{4}$	58	36	47	do
Excelsior	do 25..	82	48 to 53	do	$2\frac{3}{4}$ to 3	57	24	44	do
Pioneer	Aug. 1..	89	42 to 48	do	$2\frac{1}{2}$ to 3	56	32	51	Slightly.
Stella	July 26..	83	42 to 45	do	$2\frac{3}{4}$ to $3\frac{1}{2}$	55		49	None.
Common	do 26..	83	40 to 46	do	$2\frac{1}{2}$ to $3\frac{1}{4}$	54	38	$48\frac{3}{4}$	do
Mansfield	Aug. 1..	88	43 to 52	do	$2\frac{1}{2}$ to $3\frac{1}{4}$	53	36	$47\frac{1}{4}$	do
Nugent	July 31..	88	42 to 48	do	$2\frac{1}{2}$ to 3	50	10	$47\frac{1}{4}$	Slightly.
Yale	do 31..	88	48 to 56	Stiff	$2\frac{1}{2}$ to 3	49	23	$47\frac{3}{4}$	Very slightly.
Albert	Aug. 3..	91	55 to 58	Fair	$3\frac{1}{2}$ to $4\frac{1}{2}$	49	8	47	do
Brome	July 31..	88	44 to 48	do	$2\frac{1}{2}$ to 3	48	36	$48\frac{1}{4}$	Slightly.
Oderbruch	Aug. 1..	88	43 to 47	Stiff	$2\frac{1}{2}$ to 3	48	26	$49\frac{1}{4}$	None.
Empire	do 1..	89	48 to 54	Fair	$2\frac{1}{2}$ to 3	47	14	50	Slightly.
Rennie's Improved	July 26..	83	42 to 49	Stiff	2 to $2\frac{3}{4}$	47	4	48	None.
Blue (long head)	Aug. 2..	89	42 to 46	Fair	$2\frac{3}{4}$ to $3\frac{1}{4}$	47	4	$43\frac{1}{2}$	Very slightly.
Claude	do 1..	88	36 to 45	do	$2\frac{3}{4}$ to 4	46	32	$45\frac{1}{2}$	Slightly.
Vanguard	July 24..	81	34 to 42	Stiff	$2\frac{3}{4}$ to $3\frac{1}{4}$	46	32	47	None.
Petschora	do 23..	80	36 to 48	do	3 to $3\frac{3}{4}$	45	40	$46\frac{1}{4}$	do
Blue (short head)	Aug. 8..	95	36 to 40	do	$1\frac{3}{4}$ to 2	45	40	$42\frac{3}{4}$	Slightly.
Garfield	July 31..	88	51 to 60	do	$2\frac{1}{2}$ to 3	44	18	$47\frac{3}{4}$	do
Success	do 24..	80	36 to 48	do	2 to 3	43	46	$45\frac{1}{2}$	None.
Argyle	Aug. 3..	91	48 to 54	Fair	$2\frac{3}{4}$ to $3\frac{1}{2}$	43	16	$46\frac{1}{2}$	Slightly.
Surprise	do 1..	89	30 to 48	Stiff	2 to $2\frac{3}{4}$	41	2	$50\frac{3}{4}$	do

The list of six-rowed barleys includes fifteen of the new hybrid sorts which have been produced at the experimental farms. The following are the names and parentage of these new six-rowed forms :—

1.	Royal—Swedish (two-rowed)	Female	Baxter's (six-rowed)	Male
2.	Trooper—Swedish (two-rowed)	do	Baxter's (six-rowed)	do
3.	Summit—Swedish (two-rowed)	do	Baxter's (six-rowed)	do
4.	Phœnix—Baxter's (six-rowed)	do	Two-rowed (name lost)	do
5.	Pioneer—Swedish (two-rowed)	do	Baxter's (six-rowed)	do
6.	Stella—Swedish (two-rowed)	do	Baxter's (six-rowed)	do
7.	Mansfield—Duck-bill (two-rowed)	do	Rennie's Imp. (six-rowed)	do
8.	Nugent—Swedish (two-rowed)	do	Baxter's (six-rowed)	do
9.	Yale—Duck-bill (two-rowed)	do	Rennie's Imp. (six-rowed)	do
10.	Albert—(Four-rowed)	do	Can. Thorpe (two-rowed)	do
11.	Brome—Rennie's Impd. (six-rowed)	do	Duck-bill (two-rowed)	do
12.	Empire—Rennie's Impd. (six-rowed)	do	Duck-bill (two-rowed)	do
13.	Claude—Duck-bill (two-rowed)	do	Common (six-rowed)	do
14.	Garfield—Baxter's (six-rowed)	do	Duck-bill (two-rowed)	do
15.	Argyle—Baxter's (six-rowed)	do	Duck-bill (two-rowed)	do

Nos. 1, 2, 3, 4, 5, 6 and 8, were the results of experiments carried on at the Central Farm by the Director and have nearly all been produced from sports from one cross, which have been carefully watched and selected by Mr. W. T. Macoun, and all sports not true to the type rejected. From Mr. Macoun's experiments at the Central Farm, Nos. 10, 14 and 15 have been produced, while Nos. 7, 9, 11 and 12 were originated at the branch farm at Agassiz by the experiments of Dr. A. P. Saunders, and No. 13 by Mr. Thos. A. Sharpe, also at Agassiz.

FIELD CROPS OF SIX-ROWED BARLEY.

Odessa.—$\frac{3}{4}$ acre. This was adjoining Canadian Thorpe, but on somewhat better land; the manuring and treatment were the same. Sown 5th May; $1\frac{3}{4}$ bushels per acre: came up 11th May, and was ripe 27th July. The time to mature was 83 days. Yield per acre 72 bushels 13 lbs.; weight per bushel, $50\frac{1}{2}$ lbs. Length of head, $2\frac{1}{2}$ to $3\frac{1}{4}$ inches; six-rowed, length of straw, 33 to 38 inches; all standing well; growth medium and fairly even, some smut but very little rust.

The following nine varieties were sown on one-acre plots adjoining each other. The land is clay loam for the first four plots, uniform in character, the next two plots are partly clay and partly sandy loam, and the remaining three are soil of much poorer quality, partly clay and partly peaty. This variation in quality is the chief cause of the lesser yields in the last named plots. This land was manured in the autumn of 1894 with about 18 tons of barn-yard manure per acre; the crop for 1895 was wheat. It was ploughed in 1895 with the gang-plough lightly, to cover weeds and start shed grain, immediately after harvest and ploughed late in the autumn about 8 inches deep. In the spring of 1896 it was gang-ploughed and harrowed with the smoothing harrow, before sowing.

Trooper.—1 acre. Sown 4th May; $1\frac{3}{4}$ bushels per acre, came up 11th May, and was ripe 27th July. The time to mature was 84 days. Yield per acre, 40 bushels 27 lbs.; weight per bushel, $51\frac{1}{4}$ lbs. Length of head, $2\frac{1}{2}$ to $3\frac{1}{4}$ inches, six-rowed, length of straw, 32 to 36 inches; all standing well; growth medium and even; some smut, but no rust.

Royal.—1 acre. Sown 4th May, $1\frac{3}{4}$ bushels per acre, came up 11th May, and was ripe 24th July. The time to mature was 81 days. Yield per acre, 50 bushels 45 lbs; weight per bushel, 53 lbs. Length of head, $2\frac{3}{4}$ to $3\frac{1}{2}$ inches, six-rowed, length of straw, 33 to 36 inches; all standing well, growth medium and even, some smut, but no rust.

Mensury.—1 acre. Sown 4th May $1\frac{3}{4}$ bushels per acre, came up 11th May, and was ripe 25th July. The time to mature was 82 days. Yield per acre, 48 bushels 21 lbs., weight per bushel, 51 lbs. Length of head, 3 to $3\frac{1}{2}$ inches, six-rowed, length of straw, 35 to 38 inches: all standing well; growth medium to strong, very even; some smut, but no rust.

Oderbruch.—1 acre. Sown 4th May; $1\frac{3}{4}$ bushels per acre; came up 11th May, and was ripe 25th July. The time to mature was 82 days. Yield per acre, 46 bushels 35 lbs.; weight per bushel, $53\frac{1}{4}$ lbs. Length of head, $2\frac{1}{2}$ to $3\frac{1}{2}$ inches; six-rowed; length of straw, 33 to 36 inches; all standing well; growth medium; very little smut; no rust.

Vanguard.—1 acre. Sown 4th May; $1\frac{3}{4}$ bushels per acre; came up 11th May, and was ripe 25th July. The time to mature was 82 days. Yield per acre, 35 bushels, 45 lbs. Weight per bushel, $51\frac{1}{4}$ lbs. Length of head, 3 to $3\frac{1}{2}$ inches; six-rowed; length of straw, 33 to 36 inches; all standing well; growth medium and even; very little smut; no rust.

Stella.—1 acre. Sown 4th May; $1\frac{3}{4}$ bushels per acre; came up 12th May, and was ripe 27th July. The time to mature was 84 days. Yield per acre, 36 bushels; weight per bushel, 51 lbs. Length of head, $2\frac{1}{2}$ to $3\frac{1}{2}$ inches; six-rowed; length of straw, 33 to 36 inches; all standing well; growth medium to weak; a considerable quantity of smut; no rust.

Success.—1 acre. Sown 4th May; $1\frac{3}{4}$ bushels per acre; came up 11th and 12th May, and was ripe 24th July. The time to mature was 81 days. Yield per acre, 25 bushels, 9 lbs.; weight per bushel, $49\frac{1}{2}$ lbs. Length of head, $2\frac{1}{2}$ to 3 inches; six-rowed, length of straw; 28 to 32 inches; all standing well; no smut; stems very slightly rusted.

Petschora.—1 acre. Sown 4th May; $1\frac{3}{4}$ bushels per acre; came up 11th and 12th May, and was ripe 28th July. The time to mature was 85 days. Yield per acre, 18 bushels 33 lbs.; weight per bushel, $48\frac{1}{2}$ lbs. Length of head, $2\frac{1}{4}$ to $3\frac{1}{2}$ inches; six-rowed; length of straw, 28 to 33 inches; all standing well; growth rather weak and uneven; some smut; leaves slightly rusted.

Nugent.—1 acre. Sown 4th May; $1\frac{3}{4}$ bushels per acre; came up 11th and 12th May, and was ripe 3rd August. The time to mature was 90 days. Yield per acre, 21 bushels 35 lbs.; weight per bushel, $50\frac{1}{4}$ lbs. Length of head, 3 to 4 inches; six-rowed; length of straw, 30 to 35 inches; all standing well; some smut; leaves and stems slightly rusted.

EXPERIMENTS WITH SPRING WHEAT.

Thirty-nine varieties of spring wheat were tested during the season of 1896, all sown on 30th April on plots of $\frac{1}{20}$ acre each. The land on which these wheats were grown was adjoining that used for the test of varieties of oats, the soil was similar and the treatment of the land the same. The previous crop was oats.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.		Inches.		Bush.	Lbs.	Lbs.	
Hungarian	Aug.	4	96	47 to 51	Stiff	3 to 3¾	Bearded	24	20	63	Slightly.
Preston	do	3	95	39 to 51	do	3 to 4	do	24		62	do
Stanley	do	3	95	39 to 48	do	3 to 4	Beardless.	23		60¼	do
Alpha	do	3	95	46 to 55	do	3 to 4	do	22	50	60½	do
White Russian	do	9	101	45 to 54	do	3½ to 4½	do	22	30	60½	do
Monarch	do	8	100	48 to 54	do	3½ to 4½	do	22	10	60¼	do
Colorado	do	4	96	44 to 50	do	3 to 3½	Bearded	22		62½	do
Golden Drop	do	4	96	40 to 48	do	2¾ to 3¼	Beardless.	21	40	61	do
Beauty	do	7	99	51 to 60	do	3½ to 5	do	21	30	59¼	do
Rio Grande	do	9	101	50 to 55	do	3¾ to 5	Bearded	21	20	63	do
Progress	do	3	95	48 to 58	do	3 to 4	Beardless.	21	10	60¾	do
Red Fife	do	8	100	40 to 48	do	3 to 4	do	20	40	61¼	Very slightly.
Beaudry	do	4	96	39 to 54	do	2¾ to 3½	Bearded	20	20	63½	do
Goose	do	10	102	48 to 54	do	2½ to 3	do	19	40	64½	do
Dawn	July	30	91	42 to 48	do	3 to 4	Beardless.	19	40	61½	Slightly.
Crown	Aug.	4	96	42 to 51	do	3 to 4	Bearded	19	20	59	Very slightly.
Advance	do	4	96	42 to 56	do	3 to 4½	do	19	20	60¾	do
Vernon	do	5	97	42 to 51	do	2¾ to 3¼	do	19	10	61¾	Slightly.
Huron	do	4	96	39 to 52	do	3 to 4½	do	19		60½	Very slightly.
Pringle's Champlain	do	8	100	51 to 60	do	3½ to 5	do	19		60¾	do
Black Sea	July	31	92	42 to 48	do	3 to 4	do	17	40	59	Slightly.
Herisson Bearded	Aug.	5	97	38 to 48	do	1¾ to 2¾	do	17	30	64¾	Very slightly.
Percy	do	4	96	48 to 56	do	3½ to 4½	Beardless.	17	20	61	do
Percy White Chaff	do	4	96	44 to 54	do	3½ to 4½	do	16	50	60½	do
Captor	do	5	97	48 to 57	do	3½ to 4½	do	16	40	59½	Slightly.
Red Fern	do	8	100	48 to 59	do	4 to 5	Bearded	16	40	62½	Very slightly.
White Connell	do	10	102	44 to 52	do	3 to 3¾	Beardless.	16	40	60¾	Slightly.
Ladoga	July	30	91	36 to 48	do	3 to 4	Bearded	16	20	59	do
Admiral	Aug.	5	97	46 to 53	do	3 to 4	Beardless.	16	10	59¾	do
Old Red River	do	9	101	42 to 48	do	2¾ to 3½	do	15	40	61	do
Captor Red Chaff	do	7	99	48 to 57	do	3½ to 4½	do	15	10	58¾	Very slightly.
Dion's	do	8	100	46 to 56	do	4 to 5	Bearded	15		62	do
Wellman's Fife	do	9	101	48 to 57	do	4 to 5	Beardless.	14	50	60¾	Slightly.
Emporium	do	8	100	48 to 54	do	3½ to 4½	Bearded	14	40	63	Very slightly.
Campbell's White Chaff	do	5	97	41 to 48	do	2¾ to 3¾	Beardless.	14	40	59	Slightly.
White Fife	do	10	102	42 to 48	do	3 to 3¾	do	14	20	61	do
Blenheim	do	3	95	46 to 54	do	3 to 4	Bearded	14		59¾	Very slightly.
Dufferin	do	2	94	45 to 52	do	3 to 4	do	13	30	58½	Slightly.
Gehun	do	5	97	36 to 42	do	3¼ to 4	Beardless.	9		60	do

In the preceding list there are included fifteen of the new cross-bred sorts which have been originated at the experimental farms. The following is a list of their names with their parentage :—

1. Preston—Ladoga .... Female with Red Fife .... Male.
2. Stanley—Ladoga .... do Red Fife .... do
3. Alpha—Ladoga .... do White Fife .... do
4. Beauty—Red Fife .... do No. 1 Club Bombay... do
5. Progress—Red Fife .... do Ladoga .... do
6. Dawn—Early Sonora .... do Red Fife .... do
7. Crown—Ladoga .... do White Fife .... do
8. Advance—Ladoga .... do White Fife .... do

9. Vernon—Ladoga	Female with	Early Sonora	Male.
10. Huron—Ladoga	do	White Fife	do
11. Percy—Ladoga	do	White Fife	do
12. Captor—Ladoga	do	White Fife	do
13. Admiral—Campbell's White Chaff	do	Red Fife	do
14. Blenheim—Ladoga	do	White Fife	do
15. Dufferin—Anglo-Canadian	do	Indian Karachi	do

Of these results in cross-fertilizing seven are bearded varieties, and nine beardless. Seven of them were originated at the Central Farm by the Director—Nos. 1 and 2 in 1888; Nos. 6 and 9 in 1889; and Nos. 5, 13 and 15 in 1890. Seven were originated at the Central Farm by Dr. A. P. Saunders—Nos. 3, 7, 8, 10, 11, 12 and 14, all in 1888, and one by Mr. J. L. McMurray of the Experimental Farm staff, No. 4, at the Central Farm in 1890. The chief purposes in view in this work of cross-breeding were to add to the number of vigorous and productive sorts, and to produce early ripening varieties of high quality. In most of these crosses Red Fife or White Fife have been used as a basis for quality, vigour and productiveness, and Ladoga, Early Sonora, Indian Karachi, and No. 1 Club Bombay for earliness in ripening.

HOW VARIETIES OF CROSS-BRED AND HYBRID GRAIN ARE PRODUCED.

The production of new varieties of grain by cross-fertilizing and hybridizing is one of the most interesting and important branches of work carried on at the Experimental Farms. The term cross-bred is used when referring to the crosses produced between different varieties of the same species, and the word hybrid when referring to new forms produced by crossing plants which are classed by botanists as distinct species, such as two-rowed and six-rowed barley. The manner in which a cross is effected is as follows: Suppose the experiment to be carried on with wheat, an ear is selected soon after it has shot out from the sheath. This ear consists of a series of clusters called spikelets, which are arranged alternately on opposite sides of the stalk of straw; later, each spikelet, if well filled, will contain from three to five kernels of wheat, at present the kernels are not formed and the hollow centres which they are destined to fill are now occupied with the flowers of the grain. In Fig. 7 we have a portion of such a wheat ear with all the spikelets but one removed, and from one side of this in which is one of the floral chambers, the double sheathing of chaff—known as the glumes—have been turned down, and the flower of the wheat is exposed to view. In this figure, also in that which follows, the parts are magnified exactly four times the natural size. These were drawn from nature by Dr. C. E. Saunders. The flower is seen to consist of three stamens which are thread-like at the base and developed into an elongated sac above, called an anther which contains the fertilizing pollen, and a double branched feathery pistil. The stamens are spoken of as the male organs,

Fig. 7.

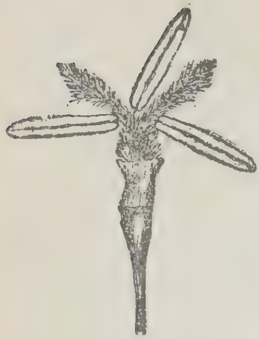


Fig. 8.

and the pistil as the female. The flower of the oat also magnified four diameters, which is shown detached from its sheath in Fig. 8, closely resembles that of the wheat, but here the stamens and pistil are more distinctly seen.

In nature, fertilization takes places within the tightly closed chaffy case, where, as the anthers mature, they burst open and the pollen they contain is shed on the delicate feathery pistil. Portions of this pollen remain attached to the surface of the pistil and from one or more of these minute microscopic bodies a small thread-like growth proceeds which gradually lengthens and piercing the soft tissues of the pistil soon extends to its base where it enters the ovary which is shown below the base of the pistil in Fig. 8. and fertilization takes place, resulting in the growth of a kernel. Where it is desired to effect a cross the outer glume or coating of chaff is torn off by the use of a pair of finely pointed forceps and the inner coating pulled back by seizing it at the upper end and bending it downwards thus exposing the flower. The anthers are now carefully examined usually with a magnifying lens and if their condition is sufficiently advanced to offer the possibility of any of the pollen having been shed, the spikelet is rejected and torn off and others examined until flowers are found where the stamens are green but almost mature. These are removed with great care as the slightest injury to the soft and delicate pistil will cause it to wither, and after the removal of the stamens from a sufficient number of selected flowers, all other portions of the head are torn off and rejected. Having previously collected heads of another variety which it is desired should serve as male, flowers are sought for which contain anthers mature and covered with pollen when the individual flowers to be fertilized are again opened in succession by bending down the glume, when the soft pistil is gently touched with one or more of the pollen bearing anthers from the other variety until a perceptible quantity of the fertilizing powder has been applied. The flower case is again carefully closed and when all the flowers prepared in the head have thus been operated on, the mutilated head is wrapped in thin manilla paper and so secured by tying as to prevent the possibility of access of other pollen either by wind or insects. To prevent accidents the covered head is now tied to a piece of stick or bamboo cane and remains untouched until harvest time when any kernels which have formed will be mature, and each one of these when sown the following season will form the starting point of a new variety.

The single plant grown the first year will produce heads all alike and may take after the female plant which has supplied the pistil and on which the kernel has grown, or they may resemble those on the plant from which the pollen has been gathered. In any case if the cross has been accomplished the grain from the plant of the first year, when sown the next season, will usually produce several different forms, some resembling one parent and some the other, while others again may be more or less intermediate in character. After selecting the most desirable type or types from a cross, all other forms are discarded and only those retained from year to year which are true to the types selected. After several seasons of careful selection the type usually becomes established and is then fairly permanent. Variations will however in many cases still occur occasionally, even after the variety is supposed to have become fixed, these variations are known as sports and must be separated whenever they appear or the new grain will not be preserved pure.

To accomplish such work as cross-breeding requires much care, and with all the skill which trained hands can bring to bear on it the ripened kernels are always few compared with the number of flowers operated on. A partial record of the crossing done on wheat at the experimental farms shows that from 1,650 flowers carefully crossed but 220 kernels were obtained which is about 1 in 8, nevertheless during the past six years more than 700 cross-bred and hybrid varieties of grain have been produced at the farms.

EXPERIMENTS WITH PEASE.

During the past season thirty-six varieties of pease have been tested on uniform plots of one-twentieth acre each, the results of which are given in table No. 1. The soil on which these pease were sown was a light sandy loam and the previous crop was oats. The land was manured in the spring of 1894 with about 12 tons of barn-yard manure per acre. It was ploughed in the spring of 1896 about six inches deep, disc-harrowed once and harrowed twice with the smoothing harrow before sowing. The plots were all sown on 23rd April with the following results :—

PEASE—TEST OF VARIETIES—TABLE NO. 1.

Name of Variety.	Date of Ripening.	No. of days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				Inches.	Inches.		Bush.	Lbs.	Lbs.
Creeper	Aug. 7..	106	Strong....	60 to 84	2 to 2½	Small	45	50	63½
Victoria	do 16..	115	do ...	84 to 96	2¼ to 3	do	44	40	63½
Canadian Beauty	do 12..	111	do ...	72 to 84	2¼ to 3	Large	44	20	63
Agnes	do 4..	103	Medium..	54 to 60	2¼ to 3	do	44	20	62
Bruce	do 9..	108	Strong....	60	2¼ to 3	do	44	..	62½
Mackay	do 8..	107	do ...	72 to 96	2¼ to 3	do	44	..	62¾
Prussian Blue	do 4..	103	do ...	84 to 96	2 to 2½	Medium..	43	20	63¼
Kent	do 13..	112	do ...	84	2½ to 3	Large	43	20	62
Vasey	do 14..	113	do ...	84 to 96	2¼ to 3	do ...	43	..	62¾
Black-eyed Marrowfat	do 8..	107	do ...	60 ...	2½ to 3	do	42	..	62½
Duke	do 11..	110	do ...	72 to 84	2 to 2¾	do	42	..	62
Tracey	do 12..	111	do ...	60 to 72	2¼ to 3	Medium..	41	40	62¾
Crown	do 6..	105	do ...	48 to 72	2 to 2½	Small	41	30	64¾
Golden Vine	do 5..	104	do ...	60	2 to 2½	do	40	40	64
New Potter	do 7..	106	do ...	60 to 72	2¼ to 3	Large	40	30	61¾
Prince Albert	do 11..	110	do ...	60 to 72	2 to 2½	Small	40	20	63¼
Daniel O'Rourke	do 3..	102	Medium..	54 to 60	2¼ to 2¾	do	40	20	62¼
Mummy	July 29..	97	do ..	42 to 54	1¾ to 2½	Medium..	40	..	65¼
Multiplier	Aug. 10..	109	Strong....	60	2 to 2½	Small	39	40	63½
Prince	do 7..	106	Medium..	48 to 54	2½ to 3	Large	39	40	62½
Luther	do 12..	111	Strong....	72 to 84	2¼ to 2¾	do	39	30	63¼
Paragon	do 8..	107	do ...	60 to 72	2¼ to 3	Medium..	39	20	63½
Pride	July 28..	96	Medium..	24 to 30	2 to 2¾	Large	38	30	65
Derby	Aug. 12..	111	do ..	54 to 60	2¼ to 3	do	38	10	62
Fenton	do 11..	110	do ..	60	2½ to 3	do	37	30	61¾
Elva	do 15..	114	Strong....	72 to 84	2¼ to 3	Medium..	37	30	62¾
Macoun	do 10..	109	do ...	60 to 72	2¼ to 3	Large	37	20	64
Archer	do 11..	110	do ...	72 to 84	1¾ to 2¼	Medium..	37	20	63½
Arthur	do 4..	103	do ...	60	2 to 2¾	do ..	37	20	63¾
Trilby	do 10..	109	Medium..	48 to 60	2 to 3	do ..	37	..	62¼
Centennial	do 12..	111	Strong...	84 to 96	2¼ to 2¾	do ..	37	..	63¾
Bedford	do 12..	111	do ...	72 to 84	1¾ to 2¼	do ..	36	20	62½
Alma	do 13..	112	do ...	84	2 to 2½	Small	36	20	63
Carleton	do 11..	110	do ...	72	2 to 2½	Medium..	35	..	64
Large White Marrowfat	do 5..	104	do ...	66 to 72	2 to 3	Large	34	..	62½
Excelsior	do 13..	112	do ...	60 to 72	2¼ to 2¾	Medium..	32	40	62¾

Thirty-eight additional sorts were sown in smaller plots of one-fortieth of an acre each and the results are recorded in table No. 2. Soil, sandy loam of fair quality, the previous crop was horse-beans. This land received a dressing of barn-yard manure about 12 tons per acre during the winter of 1895-96. The manure was left in small heaps of about half a cart load each, distributed regularly and spread early in the spring. The manure was ploughed under about 6 inches deep, and the land harrowed twice with the smoothing harrow before sowing.

PEASE—TEST OF VARIETIES—TABLE NO. 2.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
					Inches.	Inches.		Bush.	Lbs.	Lbs.
Chancellor	May 9	Aug. 11	94	Strong	84	2¼	Small	50	40	63¾
Pictou	April 23	do 8	107	Medium	48 to 72	2¼ to 3	Medium	46	20	62¼
Hazen	do 23	do 9	108	Medium	48 to 54	2¼ to 3	do	45	20	61¾
King	do 23	do 10	109	Strong	60 to 72	2½ to 2¾	Large	44	20	62¼
White Wonder	May 9	do 11	94	Medium	36 to 48	2 to 2¾	Medium	44	20	63⅓
Vincent	April 23	do 4	103	do	54 to 60	2½ to 2¾	Large	42	40	62¾
Early Britain	May 9	do 13	96	Strong	72	2¼ to 2¾	do	42	40	61½
Nelson	April 23	do 3	102	Medium	54	1¾ to 2¼	Medium	42	20	63¼
Surrey	do 23	do 11	110	Strong	60 to 84	2¼ to 2¾	Large	41	40	62
Perth	May 2	do 10	....	Medium	60	2¼ to 3	do	38	40	61¾
Bright	April 23	do 15	114	Strong	72 to 84	2¼ to 3	Medium	38	20	63
Lanark	May 2	do 15	105	do	84	2½ to 3	Large	38		61¾
Moore	do 2	do 10	100	do	89	2¼ to 3	do	37	40	61
Comet	do 2	do 17	107	do	84 to 96	2¼ to 3	Medium	36	40	63
Forbes	do 2	do 13	103	do	60 to 72	2¼ to 2¾	do	35	40	63
Grant	do 2	do 14	104	do	60 to 72	2¼ to 3	Large	35	20	62¾
Jackson	do 2	do 14	104	Medium	48 to 60	2¼ to 3	do	34		62¼
Leader	do 2	do 13	103	Strong	60 to 72	2¼ to 3	do	34		62
Cooper	do 2	do 13	103	do	72	2¼ to 2¾	do	34		62¼
Albion	do 2	do 15	105	do	84 to 96	2¼ to 2¾	Medium	34		62½
Dexter	do 2	do 17	107	do	60 to 72	2¼ to 3	Large	33	20	61¾
Elliott	do 2	do 16	106	do	60 to 72	2¼ to 3	Medium	33		61½
Dixon	do 2	do 17	107	do	84 to 96	2½ to 3	Large	33		61½
Gregory	do 2	do 14	104	do	60 to 72	2¼ to 2¾	Medium	32	40	63
Weston	do 2	do 19	109	do	108	2½ to 3	do	32	40	63¼
Chelsea	do 2	do 16	106	do	72 to 84	2¼ to 2¾	Large	31	40	63
Ogden	do 2	do 18	108	do	108	1¾ to 2½	Small	31		62¾
Pearl	April 23	do 12	111	do	....	2¼ to 2¾	Large	30	20	62
Fergus	May 2	do 14	104	do	72	2 to 2½	Small	30	20	62¼
Prospect	do 2	do 16	106	do	60 to 72	2¼ to 3	Large	30	20	62
Elder	do 2	do 16	106	do	72 to 84	1¾ to 2¼	Small	30		62¼
Lisgar	do 2	do 13	103	do	72 to 84	2¼ to 3	Large	30		61¼
Kerry	do 2	do 18	108	do	108	2¼ to 3	do	30		62¼
Nixon	do 2	do 15	105	do	60 to 72	2¼ to 3	Medium	28	20	61¼
Kingsford	do 2	do 17	107	do	96	2¼ to 2¾	Small	28	20	62¼
Herald	do 2	do 16	106	do	84 to 96	2¼ to 2¾	do	28	20	62
Dover	April 23	do 13	112	do	60 to 72	2¼ to 3	Medium	27		63
Clarke	May 2	do 18	108	do	96	2 to 2¾	Small	26		62¾

The two preceding tables contain no less than fifty-six of the new cross-bred sorts which have been originated at the experimental farms. The following is a list of their names with their parentage, the names are arranged in the order in which they appear on the lists:—

1	Victoria—Mummy	Female.	Large White Marrowfat	male.
2	Agnes—Large White Marrowfat	do	Pride	do
3	Bruce—Black-eyed Marrowfat	do	Mummy	do
4	Mackay—Mummy	do	Black-eyed Marrowfat	do
5	Kent—Mummy	do	Black-eyed Marrowfat	do
6	Vasey—Black-eyed Marrowfat	do	Mummy	do
7	Duke—Mummy	do	Black-eyed Marrowfat	do
8	Tracey—Mummy	do	Large White Marrowfat	do
9	Prince—Mummy	do	Black-eyed Marrowfat	do
10	Luther—Mummy	do	Black-eyed Marrowfat	do
11	Paragon—Black-eyed Marrowfat	do	Mummy	do
12	Derby—Black-eyed Marrowfat	do	Mummy	do

13	Fenton—Pride	Female.	Black-eyed Marrowfat	male.
14	Elva—Mummy	do	Large White Marrowfat	do
15	Macoun—Mummy	do	Large White Marrowfat	do
16	Archer—Mummy	do	Multiplier	do
17	Arthur—Mummy	do	Multiplier	do
18	Trilby—Black-eyed Marrowfat	do	Mummy	do
19	Bedford—Mummy	do	Multiplier	do
20	Alma—Mummy	do	Multiplier	do
21	Carleton—Mummy	do	Multiplier	do
22	Picton—Mummy	do	Large White Marrowfat	do
23	Hazen—Mummy	do	Large White Marrowfat	do
24	King—Mummy	do	Lathyrus	do
25	Vincent—Large White Marrowfat	do	Pride	do
26	Nelson—Mummy	do	Multiplier	do
27	Surrey—Black-eyed Marrowfat	do	Mummy	do
28	Perth—Large White Marrowfat	do	Pride	do
29	Bright—Mummy	do	Large White Marrowfat	do
30	Lanark—Large White Marrowfat	do	Pride	do
31	Moore—Pride	do	Black-eyed Marrowfat	do
32	Comet—Mummy	do	Large White Marrowfat	do
33	Forbes—Large White Marrowfat	do	Lathyrus	do
34	Grant—Mummy	do	Black-eyed Marrowfat	do
35	Jackson—Large White Marrowfat	do	Mummy	do
36	Leader—Large White Marrowfat	do	Lathyrus	do
37	Cooper—Large White Marrowfat	do	Lathyrus	do
38	Albion—Mummy	do	Large White Marrowfat	do
39	Dexter—Black-eyed Marrowfat	do	Mummy	do
40	Elliot—Black-eyed Marrowfat	do	Mummy	do
41	Dixon—Large White Marrowfat	do	Lathyrus	do
42	Gregory—Mummy	do	Large White Marrowfat	do
43	Weston—Mummy	do	Large White Marrowfat	do
44	Chelsea—Mummy	do	Large White Marrowfat	do
45	Ogden—Mummy	do	Multiplier	do
46	Pearl—Mummy	do	Large White Marrowfat	do
47	Fergus—Mummy	do	Multiplier	do
48	Prospect—Mummy	do	Large White Marrowfat	do
49	Elder—Mummy	do	Multiplier	do
50	Lisgar—Black-eyed Marrowfat	do	Mummy	do
51	Kerry—Mummy	do	Large White Marrowfat	do
52	Nixon—Black-eyed Marrowfat	do	Mummy	do
53	Kingsford—Multiplier	do	Mummy	do
54	Herald—Mummy	do	Multiplier	do
55	Dover—Mummy	do	Large White Marrowfat	do
56	Clarke—Multiplier	do	Mummy	do

Of these 56 new varieties, eighteen were originated at the central farm in 1892 by Mr. W. T. Macoun, Nos. 1, 2, 3, 13, 14, 15, 25, 28, 29, 30, 31, 32, 38, 42, 43, 46, 51 and 55; four at the branch experimental farm at Brandon by Mr. S. A. Bedford, in 1892, Nos. 19, 20, 45 and 49; four at the branch farm at Agassiz, by Mr. Thos. A. Sharpe, in 1892, Nos. 33, 36, 37 and 41 and the remaining thirty by Dr. A. P. Saunders, all in 1892. Eight of these were the results of work done at the branch farm at Brandon, Nos. 16, 17, 21, 26, 47, 53, 54, and 56; sixteen at the branch farm at Indian Head, Nos. 3, 4, 5, 6, 7, 9, 10, 11, 12, 18, 27, 34, 39, 40, 50 and 52, and six at the branch farm at Agassiz, Nos. 22, 23, 24, 35, 44 and 48. The chief object in view in the cross-breeding of pease has been to obtain new varieties of good size with increased vigour and productiveness

FIELD CROPS OF PEASE.

Daniel O'Rourke.—2 acres. The soil was a sandy loam of fairly good quality which received a dressing of about 12 tons of barn-yard manure per acre, in the autumn of 1895 when it was ploughed under. In the spring of 1896 the land was disc-harrowed twice and harrowed twice with the smoothing harrow before sowing. Sown 1st May 2½ bushels per acre, came up 11th May and was ripe 7th August. The time to mature was 99 days. Yield per acre 50 bush. 59 lbs. Weight per bushel 63¼ lbs. The growth was medium but the vines were well podded.

Pride.—1 acre. This was sown alongside of Daniel O'Rourke but the land was higher and lighter in character. The manuring and treatment was the same. Sown 1st May 2½ bushels per acre, came up 11th May and was ripe 8th August. The time to mature was 100 days. Yield per acre 26 bush. 3 lbs., weight per bush. 64 lbs. The growth was medium and the vines were fairly well podded.

Six varieties of cross-bred pease were sown on sandy loam of fair quality, in plots of one-sixth acre each. The previous crop was oats. This land received a dressing of barn-yard manure in the spring of 1893 at the rate of about 10 tons per acre. It also received a coat of unleached ashes in the spring of 1896 of about 150 bushels per acre. The land was ploughed late in the autumn of 1895 about 8 inches deep and ploughed again from 5 to 6 inches deep early in the spring of 1896 and harrowed twice with the smoothing harrow before sowing.

Prince.—Sown 2nd May; 3 bushels per acre; up 10th May, and was ripe 14th August. The time to mature was 104 days. Yield per acre; 47 bushels 18 lbs.; weight per bushel 62 lbs. Length of pod 2½ to 3 inches; length of vine 60 to 84 inches.

Paragon.—Sown 2nd May: 3 bushels per acre; up 10th May; and was ripe 12th August. The time to mature was 102 days. Yield per acre 47 bushels; weight per bushel 63¼ lbs. Length of pod 2½ to 3 inches; length of vine 60 to 72 inches

Alma.—Sown 2nd May; 2 bushels per acre; up 10th May, and was ripe 13th August. The time to mature was 103 days. Yield per acre 45 bushels 42 lbs.; weight per bushel 64 lbs. Length of pod 2¼ to 2¾ inches; length of vine 72 inches.

Vincent.—Sown 2nd May; 3 bushels per acre; up 10th May, and was ripe 8th August. The time to mature was 98 days. Yield per acre 45 bushels 30 lbs.; weight per bushel 63 lbs. Length of pod 2½ to 3 inches. Length of vine 60 to 72 inches.

Fenton.—Sown 2nd May; 3 bushels per acre; up 10th May, and was ripe 13th August. The time to mature was 103 days. Yield per acre 41 bushels 24 lbs.; weight per bushel 62 lbs. Length of pod 2½ to 3 inches. Length of vine 60 inches.

Tracey.—Sown 2nd May; 2½ bushels per acre; up 10th May, and was ripe 15th August. The time to mature was 105 days. Yield per acre 37 bushels 30 lbs.; weight per bushel 62 lbs. Length of pod 2¼ to 2¾ in.; Length of vine 84 inches.

RESULTS OF EARLY MEDIUM AND LATE SOWING.

These tests were all conducted on similar land on $\frac{1}{10}$ acre plots, the plots adjoining each other. The soil was a sandy loam which received a light dressing of barn-yard manure, about 12 tons per acre in the autumn of 1895, when it was ploughed under. In the spring a sufficient quantity of the land for the first set of plots was disc-harrowed twice and harrowed with the smoothing harrow twice before sowing, the first sowing being made as soon as the land was in condition to receive the seed. The oats were sown at the rate of 2¼ bushels per acre, the barley 2 bushels, the spring wheat 1½ bushels and the pease at the rate of 2½ bushels per acre. A sufficient portion of the land set aside for the subsequent sowings was worked up from week to week in the manner described, as it was needed, and in this way any weeds which had started were killed and each series of plots were given the same chance at the start as far as condition of soil was concerned.

OATS SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Harvesting.	No. of Days Maturing.	Length of Straw.	Weight of Straw per acre.	Yield of grain per acre.		Weight per Bushel.	Rusted.
				Inches.	Lbs.	Bush.	lbs.		
Abundance......	April 20	Aug. 1	103	40 to 45	3,660	56	6	37¼	Very slightly.
"	do 27	do 2	97	44 to 48	2,900	75	..	37¼	None.
"	May 4	do 6	94	45 to 49	3,130	70	..	38	Very slightly.
"	do 11	do 10	91	43 to 48	3,305	58	28	35	Slightly.
"	do 18	do 14	88	43 to 47	3,510	49	24	31¼	Considerably
"	do 25	do 16	83	43 to 47	3,605	42	17	26½	"
Banner.......	April 20	do 1	103	44 to 48	2,460	71	31	36¾	Very slightly.
"	do 27	do 2	97	45 to 50	4,050	80	10	37	"
"	May 4	do 7	95	46 to 51	3,320	79	14	35½	"
"	do 11	do 11	92	45 to 50	3,540	70	10	33¾	"
"	do 18	do 15	89	43 to 49	3,895	56	26	29	"
"	do 25	do 18	85	43 to 49	3,410	51	6	24	Considerably.

BARLEY SOWN AT DIFFERENT DATES.

Canadian Thorpe..	April 20	July 31	102	33 to 44	2,710	38	16	53	Slightly.
" ..	do 27	Aug. 1	96	40 to 46	3,220	51	32	54	"
" ..	May 4	do 5	93	34 to 40	3,975	35	..	54	Very slightly.
" ..	do 11	do 8	89	36 to 40	3,775	34	23	52¼	"
" ..	do 18	do 14	88	36 to 39	3,405	33	21	49	"
" ..	do 25	do 17	84	33 to 39	2,965	27	44	49	"
Odessa............	April 20	July 24	95	34 to 38	3,825	51	42	50¼	"
"	do 27	do 24	88	33 to 38	3,460	54	38	51¼	"
"	May 4	do 25	82	33 to 36	3,205	50	5	52	None.
"	do 11	do 30	80	34 to 40	3,175	49	23	52½	"
"	do 18	Aug. 5	79	36 to 42	3,170	48	16	50¼	Very slightly.
"	do 25	do 10	77	33 to 42	3,130	42	4	50½	"

SPRING WHEAT SOWN AT DIFFERENT DATES.

Stanley	April 20	Aug. 6	108	40 to 51	2,640	17	40	62	Very slightly.
"	do 27	do 7	102	46 to 52	3,060	21	30	62¼	"
"	May 4	do 8	96	38 to 43	2,835	20	15	63	"
"	do 11	do 11	92	37 to 45	2,950	20	5	58¾	"
"	do 18	do 15	89	36 to 43	2,730	14	30	59	"
"	do 25	do 21	87	33 to 41	2,470	10	30	59	Considerably.
Red Fife....... ..	April 20	do 9	111	43 to 49	2,275	19	35	61	Slightly.
"	do 27	do 10	105	48 to 53	4,345	26	45	63¼	"
"	May 4	do 11	99	33 to 39	4,355	20	50	63	"
"	do 11	do 15	96	36 to 45	4,340	19	30	60	"
"	do 18	do 17	91	40 to 44	3,475	18	15	56¼	Very slightly.
"	do 25	do 25	91	33 to 41	2,975	13	45	59½	Considerably.

PEASE SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Harvesting.	No. of days Maturing.	Length of Straw.	Weight of Straw per acre.	Yield of pease per acre.		Weight per bushel.
				Inches.	Lbs.	Bush.	lbs.	Lbs.
Golden Vine	April 20..	Aug. 5..	107	45 to 54	3,325	24	40	65½
"	" 27..	" 8..	103	51 to 58	3,315	30	5	65½
"	May 4.	" 10..	98	50 to 64	3,465	36	30	66
"	" 11..	" 14..	95	50 to 60	3,530	34	30	65¼
"	" 18..	" 17..	91	49 to 59	3,580	30	30	65¼
"	" 25..	" 19..	89	49 to 52	3,200	29	40	65
Mummy	April 20..	" 6..	108	45 to 50	3,210	23	35	65¾
"	" 27..	" 7..	102	50 to 56	4,520	37	50	65¾
"	May 4..	" 9..	97	48 to 52	4,585	34	55	65½
"	" 11..	" 14..	95	43 to 49	4,860	34	..	64½
"	" 18..	" 16..	90	47 to 51	4,470	30	40	64½
"	" 25..	" 18..	88	47 to 52	4,365	28	25	61¼

SUMMARY OF RESULTS OF EARLY, MEDIUM AND LATE SOWING FOR THE WHOLE PERIOD.

The following are the averages for the whole of the tests which have been continued for seven years with the oats, barley and spring wheat, and two years with the pease:—

Tests continued for Seven Years.									Tests continued for Two Years.		
Oats.	Average Yield per acre.		Barley.	Average Yield per acre.		Spring Wheat.	Average Yield per acre.		Pease.	Average Yield per acre.	
	Bush.	lbs.		Bush.	lbs.		Bush.	lbs.		Bush.	lbs.
1st Sowing	54	28	1st sowing	40	7	1st sowing	18	26	1st sowing	31	39
2nd "	58	..	2nd "	40	19	2nd "	19	13	2nd "	34	37
3rd "	48	14	3rd "	31	38	3rd "	13	47	3rd "	37	10
4th "	42	15	4th "	28	8	4th "	12	8	4th "	30	41
5th "	38	12	5th "	24	47	5th "	10	46	5th "	27	47
6th "	28	7	6th "	22	21	6th "	9	15	6th "	25	39

EXPERIMENTS WITH INDIAN CORN.

Twenty-four varieties of Indian Corn were tested side by side in 1896, on light sandy loam. The previous crop was oats. This land received a dressing of barn-yard manure in the spring of 1893, about 10 tons per acre. It also received an application of unleached ashes in the spring of 1896 of about 150 bushels per acre. The land was ploughed late in the autumn about 8 inches deep and ploughed again from 5 to 6 inches deep early in the spring. Before planting the land was disc-harrowed and harrowed with the smoothing harrow twice.

The different varieties were all planted on the 23rd of May and cut 10th September.

INDIAN CORN—TEST OF VARIETIES.

Name of Variety.	Character of Growth.	Description of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Early Milk.	Condition when cut.	Weight per acre grown in rows. Tons.	Lbs.	Weight per acre grown in hills. Tons.	Lbs.
			Inches.					Sept. 10th.				
Early Mastodon	Very strong.	Red and yellow dent	108 to 120	Leafy	Aug. 12	Aug. 15		Not yet in early milk	24	932	18	455
Golden Dent	do	do	114 to 126	do	do 14	do 23		do	21	1,850	16	743
Pride of the North	do	do	114 to 126	do	do 13	do 16		do	20	1,672	19	42
Leaming	do	do	120 to 132	do	do 12	do 16		do	20	1,527	19	72
Golden Beauty	do	do	114 to 126	do	do 14	do 21		do	20	220	15	782
Cuban Giant	do	White dent	120 to 132	Fairly leafy	do 13	do 19		do	19	1,349	16	380
Rural Thoroughbred White Flint	do	White flint	108 to 120	Very leafy	do 12	do 15		Nearly in early milk	19	42	17	558
Red Cob Ensilage	do	White dent	108 to 126	Leafy	do 14	do 22		Not yet in early milk	18	736	16	1,106
Wisconsin White Dent	do	do	108 to 114	Fairly leafy.	do 6	do 10		Early milk	17	775	15	1,363
Compton's Early	Strong	Yellow flint.	90 to 102	Leafy	July 30	do 6	Aug. 27	do	16	670	12	1,410
Pearce's Prolific	do	do	90 to 102	do	do 26	do 1	do 20	Late milk	16	525	14	1,984
Giant Prolific Ensilage	Very strong.	White dent	108 to 120	Fairly leafy.	Aug. 14	do 21		Not yet in early milk	16	234	13	1,661
Champion White Pearl	do	do	108 to 120	Leafy	do 9	do 13		Early milk	15	1,944	14	750
Longfellow	Strong	Yellow flint	90 to 102	do	July 30	do 5	Aug. 23	Late milk	15	1,364	13	136
Mammoth Eight-rowed Flint.	do	do	90 to 108	do	do 30	do 5	do 24	do	15	1,073	12	1,410
White Cap Yellow Dent	Very strong.	Yellow and white dent.	108 to 132	do	Aug. 7	do 11		Early milk	15	601	13	1,878
Sanford	Strong	White flint	96 to 108	Very leafy	July 26	do 2	Aug. 22	do	15	274	12	539
King of the Earliest	do	Red and yellow dent	102 to 114	Fairly leafy.	Aug. 12	do 16	do 21	Nearly in late milk	14	858	15	347
Early Huron Dent	do	do	96 to 108	do	July 30	do 3	do 22	Late milk	14	96	12	974
Canada White Flint	do	White flint	96 to 108	Leafy	do 31	do 6	do 24	Early milk	14	24	10	1,490
Angel of Midnight	do	Yellow flint	96 to 108	do	do 30	do 5	do 24	do	13	1,443	10	1,344
Country Gentleman	do	Wrinkled white dent	72 to 90	do	Aug. 10	do 13		Not yet in early milk	10	1,853	9	1,021
North Dakota	Medium	Pink and white flint	60 to 72	Fairly leafy.	July 19	July 21	Aug. 12	Ripe	10	1,635	9	1,275
Mitchell's Extra Early	do	White flint	66 to 78	do	do 20	do 23	do 13	do	10	1,635	10	38

FIELD CROPS OF CORN.

Thirteen varieties of corn were sown on half acre plots all in the same field. The soil was a sandy loam of fair quality with a strip of peaty soil and another of clay loam running across it. The plots were so arranged as to give to each about the same variety of soil. The land was manured in the spring of 1896 with about 12 tons of barn-yard manure per acre. The previous crop was experimental plots of grain on the sandy loam and roots and horse beans on the other portions. It was ploughed late in the autumn about 8 inches deep, and the manure spread in the spring was ploughed under about 6 inches deep and harrowed with the smoothing harrow before planting. The corn was all planted in hills three feet apart each way on 22nd May, came up 4th to 6th June and was cut for silo on 25th September. The weight of crop from these varieties, and their condition when cut was as follows:—

	Yield per Acre. Tons.	Lbs.
Early Mastodon—Height 9 to 11 feet, well cobbed, grain formed but in a watery condition	15	1750
Pride of the North—Height 10 to 12 feet, well cobbed, grain formed but in a watery condition	16	910
Leaming—Height 9 to 11 feet, well cobbed, grain nearly in the early milk stage	17	1150
Cuban Giant—Height 9 to 12 feet, ears formed but in an immature watery condition	17	190
Red Cob Ensilage—Height 10 to 12 feet, well cobbed, but grain not formed	21	1830
Pearce's Prolific—Height 7 to 8 feet, well cobbed, in dough stage, beginning to ripen	13	370
Giant Prolific Ensilage—Height 10 to 12 feet, well cobbed, grain forming but in watery condition	17	120
Champion White Pearl—Height 9 to 11 feet, well cobbed, ears in early milk stage	19	338
White Cap Yellow Dent—Height 9 to 11 feet, well cobbed, grain in dough stage	15	1210
Sanford—Height 9 to 11 feet, well cobbed, grain in dough stage	12	1674
King of the Earliest—Height 8 to 10 feet, well cobbed, grain in dough stage	11	1012
Early Huron Dent—Height 8 to 10 feet, well cobbed, grain in dough stage	10	680
Canada White Flint—Height 8 to 10 feet, well cobbed, grain in dough stage	13	860

Rural Thoroughbred White Flint.—$3\frac{3}{4}$ acres.—This field was adjoining the thirteen half acre plots just referred to, and the soil and treatment was the same. It was sown 23rd May, came up 6th June and was cut 24th September. Height 8 to 10 feet, well cobbed, grain formed, but not yet in early milk. Yield per acre 14 tons 970 lbs.

Longfellow—3 acres.—Soil a sandy loam of fair quality which received a dressing of barn-yard manure about 18 tons per acre early in the spring of 1894. Has received no manure since. The previous crop was oats seeded with Mammoth Red clover 8 lbs. per acre. After the oat crop was harvested the clover was allowed to grow until the 25th of May following, by which time it had attained a height of 12 to 14 inches and had formed a heavy mat of foliage. This was ploughed under about 6 inches deep, disc-harrowed twice and harrowed twice with the smoothing harrow which brought the land into good condition for planting. Planted in hills three feet apart each way 30th May, came up 9th June and was cut 21st September. Height 7 to 10 feet, well cobbed, grain well advanced in the dough stage. Yield per acre, 14 tons 615 lbs.

Two other varieties of corn were planted in the same field as the Longfellow, on similar land which had similar treatment, as follows:—

Mammoth Eight-rowed Flint.—3¼ acres. Planted in hills 3 feet apart each way on 30th May; came up 8th and 9th June, and was cut 19th September. Height, 7 to 10 feet well cobbed, grain in the dough stage. Yield per acre, 13 tons 1,205 lbs.

Angel of Midnight.—3½ acres. Planted in hills 3 feet apart each way on 30th May; came up 8th and 9th June, and was cut 18th September. Height, 7 to 10 feet, well cobbed, grain in the dough stage. Yield per acre, 15 tons 328 lbs.

EXPERIMENTS WITH TURNIPS.

Of turnips fourteen varieties were tested during the past season on plots all adjoining each other and all having similar treatment. The soil was a rather light sandy loam of good quality. The previous crop was experimental plots of grain. Soon after harvest, in 1895, the land was ploughed very shallow, about two inches deep and harrowed with a smoothing harrow to cover and start weed seeds and shed grain. It was manured in the autumn of 1895 with about 12 tons of barn-yard manure to the acre, which was ploughed under soon after spreading about 8 inches deep. In the spring the land was again ploughed about 8 inches deep, harrowed with the smoothing harrow made up in drills two feet apart and subsequently rolled with a heavy land roller which flattened the drills about one half leaving a firm seed bed. Two sowings were made of each sort of seed at the rate of 3 lbs. per acre, the first on 8th May, the second on 22nd May, and the roots on both sets of plots were pulled on the 15th of October. The yield per acre has been calculated from the weight of roots obtained from two rows each 99 feet long.

TURNIPS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Hartley's Bronze	45	90	1,501	30	30	1,710	1,028	30
Carter's Elephant	41	335	1,372	15	28	1,090	951	30
Purple Top Swede	40	1,180	1,353	30	29	740	979	
Mammoth Clyde	37	250	1,237	30	25	215	836	55
Perfection	37	250	1,237	30	21	570	709	30
Giant King	36	600	1,210		25	1,535	858	55
Prize Purple Top	34	1,630	1,160	30	22	220	737	
Marquis of Lorne	33	660	1,111		23	1,190	786	30
Jumbo or Monarch	33	330	1,105	30	21	1,615	726	55
Prize Winner	32	1,395	1,089	55	23	860	781	
Selected Champion	32	1,010	1,083	30	20	1,910	698	30
East Lothian	31	425	1,040	25	21	1,230	720	30
Sutton's Champion	30	1,380	1,023		22	880	748	
Skirving's	28	485	941	25	21	1,670	727	50

FIELD PLOTS OF TURNIPS.

The fourteen varieties of turnips which were sown in the uniform test plots were also sown in a field crop in plots of one-tenth acre each side by side. This land was a heavy sandy loam which was sown with oats in 1895 and at the same time seeded with Mammoth Red clover about 8 lbs. per acre. This made a good catch and grew rapidly after the oat crop was harvested. It was ploughed under on 25th May following by which time it had formed a fine mat of foliage from 12 to 14 inches high. The land was harrowed with the spade-harrow several times and subsequently with the smoothing harrow and in this way the soil was pulverized and brought into good condition for the turnip crop. Drills were made two feet apart and the drills subsequently rolled with a heavy land roller which flattened them about one half, leaving a firm seed bed. The

seed was sown on the 13th June, came up 18th June and the roots were pulled 23rd October. The yield obtained from each was as follows:—

Name of Variety.	Yield Per acre.		Name of Variety.	Yield Per acre.	
	Tons.	Lbs.		Tons.	Lbs.
Hartley's Bronze	22	1,930	Marquis of Lorne	21	300
Carter's Elephant	20	1,392	Jumbo or Monarch	20	132
Purple Top Swede	20	81	Prize Winner	20	1,190
Mammoth Clyde	20	686	Selected Champion	21	249
Perfection	21	1,207	East Lothian	18	1,812
Giant King	17	687	Sutton's Champion	19	14
Prize Purple Top	19	720	Skirving's	18	1,712

The results of these tests all seem to point to the advantage of early sowing. The uniform test plots sown on the 8th of May, gave an average crop for the fourteen plots of 35 tons 572 lbs. per acre. The second sowing of the same, made on the 22nd of May yielded an average of 24 tons 388 lbs., while this third sowing under date of the 13th of June, a time for the sowing of turnips approved and practised by many excellent farmers the average crop was only 20 tons 294 lbs. per acre.

EXPERIMENTS WITH MANGELS.

Seventeen varieties of mangels were tested in 1896, side by side. The land on which they were grown was adjoining that used for the test of varieties of turnips, and the soil and treatment was the same. The previous crop was experimental plots of grain. The seed was sown on drills 2 feet apart in the proportion of 3 to 4 lbs. per acre. Two sowings were made of each sort, the first on the 8th May and the second on the 22nd May, and the roots from both were pulled on 15th October. The drills were all made and rolled with a heavy land roller at the time of first sowing, but before the second set of plots was sown the surface of the drills was worked with a hand wheel hoe to destroy any weeds which had germinated.

The earliest sown plots have again given the largest yields, the average of the first sowing 8 tons 557 lbs. more than those of the second sowing. The returns given have been calculated from the weight of roots obtained from two rows each 99 feet long.

MANGELS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
	Tons.	Lbs.	Bus.	Lbs.	Tons.	Lbs.	Bus.	Lbs.
Mammoth Long Red (Evans)	40	1,840	1,364		35	1,610	1,193	30
Gate Post	40	520	1,342		29	1,565	992	45
Golden Tankard	40	520	1,342		27	835	913	55
Giant Yellow Intermediate (Steele)	39	1,255	1,320	55	31	370	1,039	30
Conquerer Prize Winner, yellow	38	615	1,276	55	24	1,170	819	30
Yellow Intermediate	38	285	1,271	25	35	1,995	1,199	55
Giant Yellow Intermediate (Pearce)	37	635	1,243	55	24	1,555	1,089	55
Red Fleshed Globe	36	1,095	1,218	15	32	1,395	825	55
Warden Orange Globe	36	985	1,216	25	27	120	902	
Red Fleshed Tankard	36	655	1,210	55	23	475	774	35
Giant Yellow Globe	35	950	1,182	30	29	1,400	990	
Yellow Fleshed Tankard	34	1,960	1,166		24	1,170	819	30
Golden Fleshed Tankard	34	365	1,139	25	31	370	1,039	30
Mammoth Long Red (Webb)	32	1,725	1,095	25	28	650	944	10
Champion Yellow Globe	31	975	1,049	35	28	1,420	957	
Mammoth Long Red (Steele)	30	5	1,000	5	19	1,985	666	25
Canadian Giant	25	1,480	858		20	1,910	698	30

In these tests also, early sowing has been very advantageous. The first sowing of the 17 varieties on 8th May gave an average return of 35 tons, 1,756 lbs. per acre, while the average crop of the second sowing on 22nd May has given only 27 tons, 1,999 lbs. per acre.

FIELD CROPS OF MANGELS.

These were sown in the same field with the uniform test plots of turnips. The land was similar and the manuring and treatment the same. The results were as follows :—

Mammoth Long Red (Evans).—One acre sown 8th May, came up 15th May, and the roots were pulled 17th October. Yield per acre, 22 tons 1,185 lbs.

Canadian Giant.—One acre, sown 8th May, came up 15th May, and the roots were pulled 15th October. Yield per acre, 19 tons 419 lbs.

Champion Yellow Globe.—½ acre, sown 8th May, came up 15th May, and the roots were pulled 15th October. Yield per acre, 18 tons 1,110 lbs.

Giant Yellow Intermediate.—½ acre, sown 8th May, came up 15th May, and the roots were pulled 16th October. Yield per acre, 19 tons 1,960 lbs.

EXPERIMENTS WITH CARROTS.

Twenty varieties of carrots were sown side by side on plots adjoining those used for the test of varieties of turnips. The soil and treatment of the land was the same. The seed was sown on ridges 2 feet apart at the rate of 3 to 4 lbs. of seed per acre. Two sowings were made of each sort, the first on 8th May, the second on 22nd May, and the roots from both were pulled on 15th October. After the drills were made they were rolled with a heavy land roller at the time of the first sowing, but before the second set of plots was sown, the surface of the drills was worked with a hand wheel hoe to destroy any weeds which had germinated. The yield per acre has been calculated from the weight of roots gathered from two rows each 99 feet long.

The earliest sowing has again given the largest crops, the first sowing having exceeded the second by 4 tons 1,404 lbs. per acre. The 20 plots sown on the 8th May have given an average crop of 26 tons 458 lbs. per acre, while those sown on 22nd May have yielded an average of only 21 tons 1,054 lbs. per acre.

CARROTS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Short White Vosges	35	1,665	1,194	25	25	1,810	863	30
White Belgian	31	1,470	1,057	50	20	1,250	687	30
Carter's Orange Giant (Carter)	29	1,070	984	30	22	275	737	55
White Green Top Orthe	29	80	968	..	22	880	748	..
Improved Short White	28	1,860	964	20	24	290	804	50
Iverson's Champion	28	1,090	951	30	24	510	808	30
Selected White Belgian	28	1,090	951	30	22	495	741	35
Half Long White	28	760	946	..	27	1,880	931	20
Giant Yellow Intermediate	27	505	908	25	20	260	671	..
Half Long Chantenay	27	110	918	30	22	1,870	764	30
New Giant Intermediate	26	1,845	897	25	21	1,890	731	30
Mammoth White Intermediate	26	1,790	896	30	24	1,555	825	55
Giant White Vosges	24	1,830	830	30	20	315	671	55
Early Gem	24	840	814	..	21	295	704	55
Guerande or Ox-heart	24	565	809	25	22	1,870	764	30
Carter's Orange Giant (Pearce)	24	180	803	..	18	685	611	25
Henderson's New York Market	23	585	776	25	18	960	616	..
Scarlet Intermediate	20	1,305	688	25	17	980	583	..
Long Orange or Surrey	17	650	577	30	15	1,350	522	30
Long Scarlet Altringham	16	1,880	564	40	16	1,660	561	..

FIELD PLOTS OF CARROTS.

The field plots of carrots were near the uniform test plots of turnips, the land was similar and the manuring and treatment were the same. Three lbs. of seed were sown per acre and the results were as follows:—

Mammoth White Intermediate, one acre.—Sown 8th May, came up 16th May and the roots were pulled 22nd October. Yield per acre, 32 tons 10 lbs.

Improved Short White, one acre.—Sown 8th May, came up 16th May and the roots were pulled 22nd October. Yield per acre, 28 tons 705 lbs.

White Belgian, ½ acre.—Sown 8th May, came up 16th May and the roots were pulled 21st October. Yield per acre, 21 tons 1870 lbs.

Iverson's Champion, ½ acre.—Sown 8th May, came up 16th May and the roots were pulled 20th October. Yield per acre, 29 tons 780 lbs.

EXPERIMENTS WITH SUGAR BEETS.

Three varieties of these were sown in plots each measuring one-eighth of an acre. The soil on which they were sown was a sandy loam of fair quality which received a dressing of barn-yard manure about 12 tons per acre in the spring of 1896. The previous crop was barley. The land was ploughed late in the autumn of 1895, and after the manure was spread it was ploughed again in the spring about 6 inches deep, harrowed with the smoothing harrow and made up in drills two feet apart. The drills were subsequently rolled with a heavy land roller which pressed them down about one half and made a firm seed bed. About 5 lbs. of seed were sown per acre with the following results:—

Vilmorin's Improved.—Sown 13th May, came up 21st May and the roots were pulled 13th October. Yield per acre 7 tons 1470 lbs.

Austrian Electoral Wohanka.—Sown 13th May, came up 21st May and the roots were pulled 13th October. Yield per acre, 11 tons 204 lbs.

Lane's Improved.—Sown 13th May, came up 21st May and the roots were pulled 13th October. Yield per acre, 12 tons 651 lbs.

EXPERIMENTS WITH POTATOES.

Ninety-six varieties of potatoes have been under test during the past season, grown side by side for the purpose of gaining information as to their relative yield, quality and earliness. The soil in which they were planted was a sandy loam which was manured in the spring of 1893 with about 18 tons of barn-yard manure per acre. The previous crop was pease. The land was ploughed in the autumn of 1895 about 8 inches deep and disc-harrowed in the spring and harrowed with the smoothing harrow, after which it was drilled for planting.

The potatoes for seed were cut into pieces from two to three eyes in each and were planted in rows 2½ feet apart with the sets about a foot apart in the rows. They were all planted on the 21st and 22nd of May, and were dug from 29th September to 3rd October. The yield per acre has been calculated from the weight of tubers obtained from one row 132 feet long. There was no rot this season in any of the varieties tested.

POTATOES—TEST OF VARIETIES.

Name of Variety.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable		Form and Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Late Puritan	455	24	431	12	24	12	White.
S. Sabean, from	430	6	411	24	18	42	"
Holborn Abundance	404	48	383	54	20	54	"
I.X.L	377	51	357	30	20	21	Pink and white.
Dreer's Standard	375	6	355	18	19	48	White.
Carman, No. 1	371	48	334	12	17	36	"
Clay Rose	355	18	342	6	13	12	Pink.
American Wonder	353	6	323	24	29	42	White.
Polaris	351	4	319		32	4	"
Everett	350	54	323	24	27	30	Pink.
Burnaby Seedling	346	30	320	6	26	24	Pink and white.
Empire State	344	18	319		25	18	White.
Ideal	341		330		11		Pink.
American Giant	341		308		33		White.
Irish Daisy	337	42	280	30	57	12	"
Early Harvest	337	42	310	12	27	30	"
State of Maine	336	36	331	6	5	30	"
Rochester Rose	327	48	300	18	27	30	Pink.
McKenzie	320	6	292	36	27	30	White.
Pride of the Table	317	54	280	30	37	24	Pink.
Seedling No. 230	316	48	294	48	22		White.
Rural Blush	316	48	297		19	48	Pink.
Brownell's Winner	312	24	300	18	12	6	Red.
Hale's Champion	311	18	270	36	40	42	White.
New Variety No. 1	309	6	288	12	20	54	"
Monroe County	308		284	54	23	6	Pink.
Seattle	305	48	278	18	27	30	White.
Chicago Market	304	42	268	24	36	18	Pink.
Flemish Beauty Seedling	304	42	261	48	42	54	Bright pink.
Troy Seedling	299	12	242		57	12	White.
Early Sunrise	294	48	269	52	24	56	Pink.
Daisy	293	42	265	6	28	36	Pink and white.
Orphans	289	13	266	12	23	6	White.
Pride of the Market	287	6	261	48	25	18	"
General Gordon	286		242		44		Pink.
Rural New Yorker, No. 2	284	54	261	48	23	6	White.
Brown's Rot Proof	283	48	266	12	17	36	Pink.
New Queen	282	42	250	48	31	54	Pink and White.
Crown Jewel	280	30	255	12	25	18	"
Money Maker	279	24	262	54	16	30	White.
Vick's Extra Early	279	24	242		37	24	Pink and white.
Peerless Junior	275		259	36	15	24	White.
Delaware	275		261	48	13	12	"
Vanier	275		245	18	29	42	Red.
Russell's Seedling	275		248	36	26	24	White.
Early Gem	269	30	211	12	58	18	Pink.
Stourbridge Glory	268	24	193	36	74	48	White.
Napoleon	267	18	250	48	16	30	Pink.
Early Rose	265	28	224	24	41	4	"
Pearce's Extra Early	265	6	224	24	40	42	"
Carman No. 3	265	6	243	6	22		White.
Satisfaction	264		240	54	23	6	"
Early Ohio	261	48	235	24	26	24	Pink.
Earliest of All	260	42	201	18	59	24	Pink and white.
Prize Taker	259	36	222	12	37	24	Pink.
From E. Lortie	257	24	228	48	28	36	Light pink.
Great Divide	256	18	234	18	22		White.
Northern Spy	255	12	228	48	26	24	Bright pink.
Seedling, No. 2, G. Edwards	254	6	235	24	18	42	White.
From J. N. Bergeron	254	6	242		12	6	Light pink.
Maggie Murphy	253		242		11		Bright pink.
Thorburn	249	42	214	30	35	12	Pink and white.
Early White Prize	247	52	225	52	22		White.
Early Six Weeks	247	30	213	24	34	6	Pink.

POTATOES—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable		Form and Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Victor Rose	245	18	226	36	18	42	Pink.
Beauty of Hebron	245	18	204	36	40	42	Pink and white.
Blue Cup	244	12	235	24	8	48	Purple and white.
Early Norther	242		204	36	37	24	Pink.
Lee's Favourite	239	48	216	42	23	6	"
Green Mountain	235	24	226	36	8	48	White.
Chas. Downing	233	12	173	48	59	24	"
Sharpe's Seedling	231	44	203	52	27	52	Pink and white.
Reading Giant	231		162	48	68	12	Red and white.
Wonder of the World	229	54	187		42	54	Pink and white.
White Beauty	228	48	198		30	48	White.
Clarke's No. 1	227	20	170	8	57	12	Pink.
Dakota Red	224	24	204	36	19	48	Red.
London	221	6	188	6	33		Pink.
Queen of the Valley	217	48	212	18	5	30	Bright pink.
Seedling No. 7	209		193	36	15	24	"
Sutton's Abundance	206	48	171	36	35	12	White.
Seedling No. 214	206	48	140	48	66		"
Hopeful	204	36	189	12	15	24	"
Lizzie's Pride	203	30	183	42	19	48	Pink, red eye.
Early Puritan	201	18	160	36	40	42	White.
Freeman	199	6	158	24	40	42	"
Table King	198		180	24	17	36	"
Record	198		169	24	28	36	"
Burpee's Extra Early	195	48	144	6	51	42	Pink and white.
Sutton's Main Crop	191	24	165		26	24	White.
Early Thorburn	191	24	155	6	36	18	Pink and white.
World's Fair	189	12	170	8	19	4	White.
Algoma No. 1	181	30	169	24	12	6	Pink.
Harbinger	159	30	136	24	23	6	Pale pink.
Pearce's Prize Winner	159	30	118	48	40	42	Pink.
Martins	158	24	127	36	30	48	Purple.

FIELD PLOTS OF POTATOES.

Twelve varieties of potatoes were planted in larger field plots, covering in all about $3\frac{1}{4}$ acres. These were planted on sandy loam of fair quality, which received a coating of barn-yard manure, about 12 tons per acre in the spring of 1896. The previous crop was pease. This land was ploughed in the autumn about 8 inches deep, and again in the spring about 6 inches deep to cover the manure, then harrowed with the smoothing harrow and drilled for planting. The sets were planted about 14 inches apart in rows which were $2\frac{1}{2}$ feet apart. They were all planted on the 21st of May, excepting the last two in the list, which were planted on the 26th of May. They came up from the 6th to the 11th of June, and were dug from the 8th to 12th of October. The yields were as follows :—

Name of Variety.	Per Acre.		Name of Variety.	Per Acre.	
	Bush.	Lbs.		Bush.	Lbs.
Clarke's No. 1	223	47	Pearce's Extra Early	187	48
Early White Prize	252	9	London	156	5
Early Sunrise	193	53	Empire State	267	25
Early Rose	137	5	Chicago Market	159	54
Lee's Favourite	237	1	Vanier	184	57
Dakota Red	195	47	Northern Spy	175	51

EXPERIMENTS WITH CLOVER.

In the annual report for 1895 the results were given of some experiments carried on that year in the sowing of clover with grain, to gain information on this very important question, can clover be grown to advantage with grain from year to year without materially lessening the crop? If this can be done, the clover will serve as an excellent catch crop, absorbing and appropriating the nitrogenous fertilizers brought down by the rain during the late summer and autumn months as well as absorbing nitrogen from the air and may be subsequently ploughed under with great advantage to the land. Further points on which information was sought were, what kinds of clover are best for this purpose, and what quantity of seed should be sown per acre.

These experiments, somewhat modified, have been continued. Last year there were eleven plots devoted to different quantities of Mammoth Red clover seed per acre from 2 lbs. to 16 lbs., including three check plots. This year seven plots were set aside for this purpose, using from 4 lbs. to 14 lbs. per acre, with one check plot. In 1895 these plots were all sown with a variety of two-rowed barley, Canadian Thorpe. This year they were sown with a six-rowed sort, Odessa.

The soil chosen for these tests was a sandy loam of fair quality, which received a light dressing of barn-yard manure about 10 tons per acre in the spring of 1896. The previous crop was Indian corn. The manure was ploughed under about 6 inches deep immediately after spreading, and the land was then harrowed twice with the smoothing harrow before sowing. The size of the plots was $\frac{1}{10}$ acre each. They were all sown with the barley 5th May $1\frac{3}{4}$ bushels per acre; came up 11th May and were ripe 27th July. The time to mature was 83 days. The crops were as follows:

Variety of Barley sown—Odessa.	Weight of straw per acre.	Yield of Barley per acre.	
	Lbs.	Bush.	Lbs.
No. 1—4 lbs. Mamm. Red Clover per acre	3,245	56	27
2—Was a check plot, had no clover	3,205	50	5
3— 6 lbs. Mamm. Red Clover per acre	2,995	56	12
4 – 8 lbs. " "	2,730	55	10
5—10 lbs. " "	2,690	52	4
6—12 lbs. " "	2,665	48	11
7—14 lbs. " "	2,535	47	14

From the slight variations in these crops above and below that given by the check plot it does not appear that the yield of barley was materially influenced by the sowing of clover with it; thus confirming the experience of last season. In 1895 all the plots were ploughed on the 4th of October, and a square block of about 6 x 6 inches of the turned furrow was taken from each plot washed clean of earth, and notes taken on the roots. This year the clover has been left to winter over. The following notes on the growth of the clover were taken at two different periods, on the 23rd of July and 14th October.

No. 1. 4 lbs. Mamnoth Red Clover per acre. 23rd July, growth weak and thin but fairly even. 14th October, height 8 to 10 inches, growth uneven and patchy, not thick enough to make good meadow or for ploughing under with advantage—a few plants in bloom.

No. 3. 6 lbs. Mammoth Red Clover per acre. 23rd July, growth weak and thin, but fairly even. 14th October, height 8 to 10 inches, growth medium to strong, would be fairly good for meadow but not thick enough for ploughing under—a few plants in bloom.

No. 4. 8 lbs. Mammoth Red Clover per acre. 23rd July, growth medium and fairly even. 14th October, height 10 to 12 inches, growth strong and even, in good condition to leave for meadow and fairly good for ploughing under, a very few plants in bloom.

No. 5. 10 lbs. Mammoth Red Clover per acre. 23rd July, growth medium to strong and even. 14th October, height 10 to 12 inches, growth strong and even, too thick for meadow but a good stand for ploughing under, very few plants in bloom.

No. 6. 12 lbs. Mammoth Red Clover per acre. 23rd July, growth medium to strong and even. 14th October, height 10 to 12 inches, growth strong and even making a thick mat of foliage, too thick to leave for meadow but in excellent condition for ploughing under, very few plants in bloom.

No. 7. 14 lbs. Mammoth Red Clover per acre. 23rd July, growth strong and even. 14th October, height 10 to 12 inches, growth strong and even, making a thick mat of foliage, too thick for meadow, but in excellent condition for ploughing under, very few plants in bloom. No advantage could be detected in this plot over that where 12 lbs. of seed were used.

The following plots adjoining those last referred to, on similar soil, with like treatment, were also sown with Odessa barley on the same date and with the barley was sown the following different kinds and quantities of clover.

Variety of Barley Sown—Odessa.	Weight of straw per acre.	Yield of Barley per acre.	
	Lbs.	Bush.	Lbs.
No. 8. 24 lbs. Crimson Clover	3,140	55	
9. 14 lbs. Alfalfa	3,170	60	20
10. 6 lbs. Alsike	3,110	64	13
11. 10 lbs. Cow Grass (Perennial Red Clover)	3,305	58	16
12. 10 lbs. Common Red Clover	3,250	55	40
13. 6 lbs. Alsike Clover with 14 lbs. Orchard Grass	2,800	46	42

There was no check plot in this series, that in the last set being near by, served for both. In plot No. 13, where the orchard grass was associated with the clover, the yield was less but this was probably due more to the variation in the soil than to the influence of the orchard grass the growth of which was quite small and weak up to the time of the cutting of the grain. The other plots do not vary enough in yield to lead to the belief that the differences are due to any material extent, to the clover. Notes were taken on the growth of the clover in these plots similar to those in the first series.

Plot No. 8. 24 lbs. Crimson Clover. 23rd July, growth fairly even, some plants in bloom. 14th October, height 6 to 8 inches, growth fairly even, not thick enough to make a good mat for ploughing under.

Plot No. 9. 14 lbs. Alfalfa per acre. 23rd July, growth weak, plants unhealthy looking with many of the leaves withered. 14th October, height 12 to 14 inches, growth fairly even, stalks rather woody, in good condition to leave for meadow but rather thin for ploughing under.

Plot No. 10. 6 lbs. Alsike per acre. 23rd July, growth very weak and feeble. 14th October, height 4 to 8 inches, growth uneven, too thin to make good meadow or for ploughing under to advantage.

Plot No. 11. 10 lbs. Cow Grass per acre (Perennial Red Clover). 23rd July, growth weak and uneven. 14th October, height 6 to 8 inches, growth uneven and patchy, may be thick enough to leave for meadow but not thick enough for ploughing under to advantage, a few plants in bloom.

Plot No. 12. 10 lbs. Common Red Clover per acre. 23rd July, growth weak but fairly even. 14th October, height 8 to 10 inches, growth even, thick enough to leave for meadow but not thick enough for ploughing under to advantage, a few plants in bloom.

Plot No. 13. 6 lbs. Alsike with 14 lbs. of Orchard Grass per acre. 23rd July. the alsike had made fair growth, and the growth of the orchard grass was medium and even. 14th October, alsike 6 to 8 inches high, growth medium and even, plants thick

enough to make a good meadow but growth not heavy enough to be ploughed under to advantage. Many plants in bloom. The orchard grass was from 2 to 3 inches high with fairly even growth, a fine catch for meadow.

Another series of tests was made with clover by sowing it with different varieties of grain, each plot having a check plot of a similar size alongside of it. As Mammoth Red Clover has given at the Central Farm better results than any other variety, this was selected for these trial plots, and 10 lbs. per acre have been used in each case, this quantity having proved sufficient to give good results in the several tests in which it has been used in the past. The trial plots in this group were 20 in number, measuring one quarter of an acre each, and were planned for the purpose of ascertaining the results on clover growth when the seed is sown with different classes of grain, and to gain some information as to how far the quantity of the clover crop and its usefulness as a fertilizer is affected by the kind of grain with which it is grown, also to further test the question whether the sowing of clover with the grain affects the yield of the latter.

The soil in this case was a heavy sandy loam of fair quality which received a dressing of barn-yard manure about 12 tons per acre in the spring of 1896, which was ploughed under about 6 inches deep immediately after spreading. The land was then harrowed twice with the smoothing harrow before sowing. The previous crop was sunflowers and corn. All the plots were sown on the same day, 1st May, the Red Fife and Preston wheats at $1\frac{1}{2}$ bushels per acre, the Odessa and Trooper barley at $1\frac{3}{4}$ bushels, the Sidney and Bolton barley at 2 bushels, the Banner and Abundance oats at $2\frac{1}{4}$ bushels and the Daniel O'Rourke and Prussian blue pease at $2\frac{1}{2}$ bushels per acre. The results were as follows :—

	Per Acre. Bushels.	Lbs.
Red Fife wheat, with 10 lbs. Mamm. Red clover per acre....	25	5
do without clover........................	23	1
Preston wheat, with 10 lbs. Mamm. Red clover per acre.....	19	17
do without clover........................	22	55
Odessa barley, with 10 lbs. Mamm. Red clover per acre.....	50	42
do without clover........................	56	32
Trooper Barley, with 10 lbs. Mamm. Red clover per acre....	38	36
do without clover........................	38	12
Sidney Barley, with 10 lbs Mamm. Red clover per acre.....	39	40
do without clover........................	38	12
Bolton Barley, with 10 lbs. Mamm. Red clover per acre.....	37	8
do without clover........................	35	8
Banner Oats, with 10 lbs. Mamm. Red clover per acre......	60	33
do without clover........................	72	..
Abundance Oats, with 10 lbs. Mamm. Red clover per acre...	68	32
do without clover........................	65	4
Daniel O'Rourke pease, with 10 lbs. Mamm. Red clover per acre	38	4
do without clover........................	35	..
Prussian Blue pease, with 10 lbs. Mamm. Red clover per acre	39	52
do without clover........................	35	..

It will be seen that seven of the plots sown with clover have given the largest yield of grain and three of those sown without clover. The total number of bushels of excess in the three plots is a little larger than the total number in the other seven plots, but the difference is small and it does not appear from this test that the sowing of clover with grain has any material influence on that crop.

The Red Fife and the Preston wheat were both ripe 6th August, the Odessa and Trooper barley 25th July. Sidney barley 1st August, Bolton 29th July, Banner oats 6th August, Abundance 7th August, Daniel O'Rourke pease 5th August, and Prussian Blue 7th August. The growth of the clover on all the plots of wheat and barley was practically the same. On 5th October it was from 10 to 12 inches high, the growth was strong and even and had made a good mat of foliage suitable for ploughing under. That sown with the oats was not so uniform or heavy, although the height was about the

same, some of the young plants had evidently been killed by the heavy shade given by the vigorous growing crops of oats. This result was still more marked in the plots sown with pease, where the clover was very uneven and patchy, and more so in the plot of Prussian Blue, because that variety produces a longer and stronger growing vine than the Daniel O'Rourke.

CONCLUSIONS.

The evidence thus far afforded by these clover tests seems to show that the sowing of clover with grain does not materially affect the crop of grain. That in the climate of Ottawa the best variety of clover to sow for ploughing under is the Mammoth Red, and that 10 lbs. of seed per acre is sufficient to produce a heavy mat of growth by the first week in October, when, if desired, it can be ploughed under to assist in fertilizing the soil for the next crop.

ACRE PLOTS OF ODESSA BARLEY SOWN WITH ALFALFA AND BROMUS INERMIS.

These were on sandy loam of fair quality, which had received a dressing of barnyard manure, about 12 tons per acre, in the spring of 1896, this was ploughed under about 6 inches deep, immediately after spreading, the land was then harrowed twice with the smoothing harrow before sowing. The barley was sown on both of these acre plots in the proportion of $1\frac{3}{4}$ bushels per acre.

One acre Odessa barley with 14 lbs. Alfalfa per acre, sown 5th May, came up 11th May, and was ripe 27th July. The time to ripen was 98 days, yield per acre 44 bushels 40 lbs. weight per bushel $50\frac{1}{2}$ lbs. By 23rd July the Alfalfa had made a medium and fairly even growth from 6 to 8 inches high, with many withered leaves, as if the plants had suffered from drought. On 14th October the Alfalfa had reached a height of 12 to 14 inches, the growth was medium and even, thick enough to make a good meadow, but not thick enough yet to plough under to advantage.

One acre Odessa barley, with 18 lbs. *Bromus inermis* (Awnless Brome grass) per acre, sown 5th May, came up 11th May, and was ripe 27th July. The time to mature was 98 days. Yield per acre 47 bushels 26 lbs., weight per bushel $50\frac{1}{4}$ lbs.

On 23rd July the Brome grass was well up and the growth fairly even. By 14th October this grass was from 2 to 3 inches high, and the growth as to vigour was medium and even. Although at this time it seemed to be somewhat thin on the ground, the rapid root growth for which this grass is noted, will no doubt soon produce a vigorous mat of foliage.

EXPERIMENTS WITH FLAX.

These experiments with flax were planned with several objects in view, namely to ascertain the quantity of flax fibre which could be produced by growing the plant in the different climates of the Dominion which prevail where the several experimental farms are located, and the quantity which could be obtained per acre when the seed was sown thinly, 40 lbs. per acre, or more thickly with 80 lbs. per acre. Also the best time for sowing in these several localities and the yield of seed per acre in each case.

A sufficient quantity of seed of the very best sort—grown one year in this country after importation from Russia—was obtained from J. Livingston, Esq., M.P., of Baden, Ont., a gentleman largely interested in the flax industry in Canada and each farm was supplied from this source. Instructions were sent with the seed to select enough land as uniform in character as possible, to provide for eight $\frac{1}{10}$th acre plots. Two of these plots were to be sown early in the season, and two on the same day each week following for four sowings, thus making the sowing period cover three weeks. The quantity of seed to be sown on one set of these plots was 40 lbs. per acre and on the other 80 lbs. per acre. Directions were also given that when the flax had reached that degree of maturity that about one third of the seed was ripe the flax on one half of each plot was to be pulled, and tied in bundles and when cured in the field the weight of straw

ascertained. On the other half of each plot the seed was to be allowed to ripen and then harvested and threshed to ascertain its yield. Arrangements were also made for packing and forwarding a bale of straw of 50 lbs. weight from each of the eight plots to Messrs. J. and J. Livingston, of Baden, Ont., to be retted and scutched and the quantity and quality of fibre in each case ascertained.

The soil selected at the Central Farm for these plots was a sandy loam of good quality, which received a dressing of barn-yard manure, about 12 tons per acre during the winter of 1895-96. The previous crop was English Horse Beans. The land was not ploughed in the autumn of 1895, but was ploughed in the spring of 1896 about 6 inches deep and harrowed with the smoothing harrow before sowing. The land for all the plots was ploughed the same date, but before each successive sowing that portion of the soil to be sown was disc-harrowed and harrowed with the smoothing harrow to destroy any weeds which might have germinated and to give each plot as to cultivation the same advantage at the start. The seed was sown broadcast and lightly harrowed to cover it and the land rolled.

The following are the results obtained at the Central Experimental Farm, the particulars of the information gained at the branch farms will be found in the reports of the superintendents.

FIRST SOWING.

Plot 1.—Forty lbs. of seed per acre, sown 7th May, came up 12th May, pulled one-half of plot for straw 28th July, when the seed was about one third ripe, height 36 to 45 inches. The other half of this plot was harvested for seed 14th August.

Weight of straw per acre..................	6,070 lbs.
Yield of seed per acre	12 bushels 28 lbs.

Plot 2.—Eighty lbs. of seed per acre, seed sown, flax pulled and seed harvested same dates as plot 1. Height of flax when pulled, 36 to 45 inches.

Weight of straw per acre	7,878 lbs.
Yield of seed per acre.....	11 bushels 20 lbs.

SECOND SOWING.

Plot 3.—Forty lbs. of seed per acre, sown 14th May, came up 19th May, pulled one-half of plot for straw, 3rd August, when the seed was about one-third ripe. Height 36 to 43 inches. The other half of this plot was harvested for seed, 14th August.

Weight of straw per acre....................	5,550 lbs.
Yield of seed per acre	17 bushels 8 lbs.

Plot 4.—Eighty lbs. of seed per acre, seed sown, flax pulled and seed harvested same dates as plot 3. Height of flax when pulled, 36 to 43 inches.

Weight of straw per acre...................	6,657 lbs.
Yield of seed per acre	15 bushels 15 lbs.

THIRD SOWING.

Plot 5.—Forty lbs. of seed per acre, sown 21st May, came up 27th May. Pulled one-half of plot for straw, 10th August, when seed was about one-third ripe. Height 33 to 39 inches. The other half of this plot was harvested for seed 16th August.

Weight of straw per acre....................	5,270 lbs.
Yield of seed per acre......................	13 bushels 2 lbs.

Plot 6.—Eighty lbs. of seed per acre. Seed sown, flax pulled and seed harvested same dates as plot 5. Height of flax when pulled, 36 to 43 inches.

Weight of straw per acre	5,420 lbs.
Yield of seed per acre	11 bushels 44 lbs.

FOURTH SOWING.

Plot 7.—Forty lbs. of seed per acre. Sown 29th May, came up 4th June. Pulled one-half of plot for straw, 17th August, when the seed was about one-third ripe. Height 31 to 37 inches. The other half of this plot was harvested for seed, 19th August.

Weight of straw per acre..................	5,570 lbs.
Yield of seed per acre	11 bushels 24 lbs.

Plot 8.—Eighty lbs. of seed per acre. Seed sown, flax pulled and seed harvested same dates as plot 7. Height of flax when pulled, 31 to 37 inches.

Weight of straw per acre	5,560 lbs.
Yield of seed per acre.....................	10 bushels 20 lbs.

In each of these sowings, except the fourth, the plots which received the 80 lbs. of seed per acre gave the largest quantity of straw, while those which received the 40 lbs. gave the largest crop of seed. The plots first sown have given the heaviest weight of straw, and those sown second in the series the largest yield of seed. The particulars as to the quantity and quality of fibre from the straw on each plot will be given later.

EXPERIMENTS WITH HORSE BEANS.

Two field plots were sown with horse beans grown for ensilage including three acres in all. The land was part sandy loam and part peaty. The previous crop was barley. It was ploughed shallow after the barley was harvested and harrowed with the smoothing harrow to start weed seeds and shed grain, and later in the autumn it was ploughed about 8 inches deep. The land was manured in the spring of 1896 with about 12 tons of barn-yard manure per acre, ploughed under about 6 inches deep and harrowed with the smoothing harrow twice. The beans were then sown with the seed drill in rows 3 feet apart, using about 50 lbs. of seed per acre.

Plot 1.—Two acres sown with "tick" beans imported seed. Sown 9th May, came up 19th May and was cut for ensilage 22nd September when the plants were still green. The growth ranged from weak to medium, the vines were well podded and a few of the pods ripe. Height from 45 to 50 inches, most of the plants had their foliage partly blighted. Yield per acre 2 tons 437 lbs.

Plot 2.—One acre sown with "tick" beans ripened last year on the Central farm. Sown 9th May, came up 18th May and was cut 21st September. The growth was weak to medium, height 45 to 50 inches with much of the foliage blighted. Yield per acre 3 tons 1,400 lbs.

These small crops were no doubt mainly due to the prevalence of blight and the unsuitable character of the soil.

EXPERIMENTS WITH SUNFLOWERS.

Two field plots covering 1½ acres in all were sown with this crop, with the object of securing a large number of seed heads to put into the silo with corn ensilage to add fatty matter to this food. The soil was a sandy loam and the previous crop was barley. The land was ploughed very shallow soon after harvest to cover and start weed seeds and shed grain and again ploughed late in the autumn about 8 inches deep. In the spring of 1896 it received a dressing of barn-yard manure about 12 tons per acre which was ploughed under about 6 inches deep, it was then harrowed with the smoothing harrow and rolled with a land roller before sowing. The seed was sown with a Planet Junior hand seed drill in rows three feet apart, and thinned out when the plants were about 3 inches high to from 16 to 18 inches apart in the rows. In growing this crop from Russian seed in former years part of the heads have given black seed and a part light coloured seeds, these were selected and sown separately during the past season.

Plot 1. One acre Mammoth Russian Sunflowers, black seed. Sown 9th May, 4 lbs. per acre, came up 15th May and the heads were cut for the silo on 18th September. Weight of heads per acre, 8 tons 645 lbs.

Plot 2. Half acre Mammoth Russian Sunflowers, light coloured seed. Sown 9th May, came up 15th May and the heads were cut for the silo 23rd September. Weight of heads per acre 7 tons 1,000 lbs.

EXPERIMENTS WITH BUCKWHEAT.

Two plots of buckwheat were sown covering in all 2¾ acres The variety used was the Silver Hull, and the soil on which it was sown was a sandy loam which received an application of unleached wood ashes about 150 bushels per acre during the winter of 1895-96. This land had been used as a nursery for young forest trees and had received no other fertilizer for ten years past. The land was ploughed in the autumn of 1895 about 8 inches deep and was ploughed again in the spring about 6 inches deep before the buckwheat was sown.

Plot No 1. One acre sown 20th June, 3 pecks of seed per acre, came up 27th June and was ripe 25th September. Yield per acre, 29 bushels 26 lbs.

Plot No 2. One and three-quarter acres. This was sown later, the same variety of seed being used. The land was adjoining plot 1, the soil partly sandy loam and part clay loam and the treatment and the preparation was the same. Sown 29th June, came up 5th July and was ripe 25th September. Yield per acre, 23 bushels 32 lbs.

TESTS OF THE ACTION OF FERTILIZERS ON SOME CROPS.

In the Annual Report of the Experimental Farm for 1893, details were given on pages 8 to 24 of the results of a series of tests which were carried on during the previous five or six years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important crops. The particulars there given covered the results of six years' experience with crops of wheat and Indian corn, and five years' experience with crops of oats, barley, turnips and mangels. The results of similar tests conducted for three years with carrots and one year with sugar beets were also given.

These experiments have been continued ; and as explanatory regarding the preparations made and the general plan, together with the way in which they have been carried on, the following paragraphs are quoted from the report of 1893 :

" A piece of sandy loam, more or less mixed with clay, which was originally covered with heavy timber, chiefly white pine, was chosen for these tests. The timber was cut many years ago, and among the stumps still remaining when the land was purchased, there had sprung up a thick second growth of trees, chiefly poplar, birch and maple, few of which exceeded six inches in diameter at the base. Early in 1887, this land was cleared by rooting up the young trees and stumps and burning them in piles on the ground from which they were taken, the ashes being afterwards distributed over the soil as evenly as possible, and the land ploughed and thoroughly harrowed. Later in the season it was again ploughed and harrowed, and most of it got into fair condition for cropping."

" The plots laid out for the experimental work with fertilizers were one tenth of an acre each, 21 of which were devoted to experiments with wheat, 21 to barley, 21 to oats, 21 to Indian corn or maize, and 21 to experiments with turnips and mangels. Owing to the difficulty and unavoidable delay attending the draining of some wet places, it was not practicable to undertake work on all the plots the first season. The tests were begun in 1888 with 20 plots of wheat and 16 of Indian corn ; and in 1889 all the series were completed excepting six plots of roots, Nos. 16 to 21 inclusive, which were available for the work in 1890." In all cases the plots in each series have been sown on the same day.

"In 1890 it was found that all the grain plots had become so weedy that the growth of the crops was much interfered with, and with the view of cleaning the land one-half of each of the wheat and oat plots was sown with carrots in 1891, and one-half of each of the barley plots with sugar beets. In 1892 the other half of each plot in each of these series was sown with carrots. In 1893 it was thought desirable to continue this cleaning process, and carrots were again sown on the half of the wheat and oat plots occupied with this crop in 1891, and also on the half of the barley plots cropped with sugar beets that year." In 1894, 1895 and 1896 the one-half of the oat plots were sown again with carrots and the half of the plots devoted to wheat and barley were planted with potatoes.

"TREATMENT OF SOIL.

"The treatment of the soil on all the grain plots has been to gang-plough soon after harvest, and after the shed grain and weeds have well started to plough again about 7 inches deep. In spring the plots have been disc-harrowed twice or gang-ploughed once before applying the fertilizers, and again harrowed with the toothed or smoothing harrow before sowing. On those plots where barn-yard manure has been used, the manure has been lightly ploughed under as soon as possible after it has been spread on the land and harrowed with the smoothing harrow before sowing. Wherever barn-yard manure is spoken of, it is understood to be a mixture of horse and cow manure in about equal proportions."

It is proposed to give each year in the annual report a summary of these permanent fertilizer plots, taking the average yield of the whole of the previous period, adding the results of the current year, and then giving the average yield for the full time. The experience of each year will add materially to the value and reliability of the tests for the whole period.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of 1½ bushels per acre, excepting in 1894; and the varieties used were as follows. In 1888-89 and 1891 White Russian, and in 1892-93 Campbell's White Chaff. In 1894 the Rio Grande wheat was used, and shortly before sowing, it was tested as to vitality and found to be very deficient in germinating power, less than half the kernels sprouted. As it was not practicable then to secure better seed, double the usual quantity of seed was sown, namely: three bushels per acre, which gave a proportion of growth on each plot of about the usual thickness. In 1895 and 1896 the Red Fife wheat was used in the usual quantity of 1½ bushels per acre. In 1896 the Red Fife was sown 2nd May, came up 9th May and was harvested 10th August, requiring from the date of sowing to maturity a period of 100 days.

The season of 1896 at Ottawa has been favourable for the growing of spring wheat, and has given crops considerably above the average. This year the plot on which the fresh manure was used has yielded 10 lbs. per acre more than that on which the rotted manure was used. This gain is not however sufficient to offset the gain of the rotted manure plot in 1895 and the rotted manure plot averages a little higher than any other plot in the series.

EXPERIMENTS with Fertilizers on Plots of Wheat $\frac{1}{20}$ acre each.

No. of Plot	Fertilizers applied each Year.	Average Yield for Eight Years. Yield of Grain. Per acre. Bush.	lbs.	Yield of Straw. Per acre. Lbs.	9th Season, 1896. Variety, Red Fife. Yield of Grain. Per acre. Bush.	lbs.	Yield of Straw. Per acre. Lbs.	Average Yield for Nine Years. Yield of Grain. Per acre. Bush.	lbs.	Yield of Straw. Per acre. Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year since..	18	$41\frac{2}{8}$	3,466	27	.	3,650	19	$36\frac{6}{9}$	3,486
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year since	18	$31\frac{3}{8}$	3,457	27	10	4,100	19	29	3,528
3	Unmanured.....	9	$57\frac{4}{8}$	1,853	14	..	1,870	10	24[illegible]	1,8[illegible]
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre......................	10	$4\frac{3}{8}$	1,789	13	..	2,140	10	23[illegible]	1,828
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre	12	$6\frac{2}{8}$	2,886	14	30	2,570	12	22[illegible]	2,851
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed, and allowed to heat for several days before using.	16	$1\frac{7}{8}$	2,954	26	30	3,430	17	11[illegible]	3,007
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre....	12	$19\frac{2}{8}$	2,728	15	10	2,440	12	38[illegible]	2,[illegible]96
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	10	$11\frac{7}{8}$	1,714	12	20	1,720	10	37[illegible]	1,715
9	Mineral superphosphate, No. 1, 500 lbs. per acre................................	11	$26\frac{7}{8}$	1,690	14	20	1,770	11	46[illegible]	1,699
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre.. ...	12	$21\frac{2}{8}$	2,956	17	10	2,700	12	53[illegible]	2,928
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	12	$27\frac{4}{8}$	2,500	18	50	3,430	13	10	2,603
12	Unmanured................................	9	$27\frac{4}{8}$	1,575	14	30	2,260	10	11[illegible]	1,[illegible]51
13	Bone finely ground, 500 lbs. per acre	10	$27\frac{1}{8}$	1,746	17	20	2,340	11	13[illegible]	1,812
14	Bone finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	13	$23\frac{1}{8}$	2,098	23	20	2,690	14	29[illegible]	2,182
15	Nitrate of soda, 200 lbs. per acre	13	$13\frac{1}{8}$	2,339	16	..	2,130	13	31[illegible]	2,316
16	Muriate of potash, 150 lbs. per acre	14	$33\frac{2}{8}$	1,899	21	40	2,300	15	20[illegible]	1,944
17	Sulphate of ammonia, 300 lbs. per acre	11	$2\frac{6}{8}$	2,480	16	..	1,250	11	35[illegible]	2,343
18	Sulphate of iron, 60 lbs. per acre	11	$59\frac{3}{8}$	1,930	14	50	1,760	12	18[illegible]	1,911
19	Common salt (Sodium chloride) 300 lbs. per acre................................	11	$38\frac{6}{8}$	1,662	19	10	1,940	12	28[illegible]	1,693
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre	12	$13\frac{6}{8}$	1,931	15	40	1,880	12	36[illegible]	1,925
21	Unmanured in 1889, mineral superphosphate, No. 2, 500 lbs. per acre, each year since.........................	12	$28\frac{4}{8}$	1,813	10	..	2,110	12	12	1,846

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in 1889, 1890 and 1891, $1\frac{1}{2}$ bushels in 1892 and 1893, and 2 bushels in 1894, 1895 and 1896. Two-rowed barley has been used for seed throughout the whole period. The varieties used were as follows: 1889, 1890 and 1891, Saale; 1892, Goldthorpe; 1893, Duck-bill; and

in 1894, 1895 and 1896 Canadian Thorpe, a selected form of the Duck-bill. In 1896 the Canadian Thorpe was sown 2nd May, came up 10th May and was harvested 10th August, requiring from the date of sowing to maturity a period of 100 days.

In 1896 the yield of all the barley plots was considerably higher than the average of past seasons. The plot fertilized with rotted barn-yard manure has given a better yield than the plot where the manure was used fresh; not enough, however, to offset the previous gains of the fresh manure plot, which still averages 1 bush. 7 lbs. higher than that of the rotted manure for the eight years these tests have been continued.

EXPERIMENTS with Fertilizers on Plots of Barley, $\frac{1}{20}$th acre.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Seven Years. Yield of Grain. Per acre. Bush.	lbs.	Average Yield for Seven Years. Yield of Straw. Per acre. Lbs.	8th Season, 1896, Variety Canadian Thorpe. Yield of Grain. Per acre. Bush.	lbs.	8th Season, 1896. Yield of Straw. Per acre. Lbs.	Average Yield for Eight Years. Yield of Grain. Per acre. Bush.	lbs.	Average Yield for Eight Years. Yield of Straw. Per acre. Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	30	39$\frac{4}{7}$	2,909	46	12	3,270	32	36$\frac{1}{8}$	2,954
2	Barn-yard manure, fresh, 15 tons per acre.	32	17$\frac{5}{7}$	3,212	44	28	4,130	33	43	3,252
3	Unmanured	13	36$\frac{5}{7}$	1,548	17	4	1,900	14	8$\frac{5}{8}$	1,592
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	13	37$\frac{6}{7}$	1,447	18	6	1,440	14	15$\frac{7}{8}$	1,446
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre	18	47	2,254	21	32	1,750	19	15$\frac{1}{8}$	2,191
6	Barn-yard manure, partly rotted, and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	24	47$\frac{4}{7}$	2,402	37	44	2,930	26	29$\frac{1}{8}$	2,468
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre.	20	44$\frac{5}{7}$	2,462	30	20	2,540	22	5$\frac{5}{8}$	2,472
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	16	42$\frac{5}{7}$	1,699	30	..	1,910	18	25$\frac{3}{8}$	1,725
9	Mineral superphosphate No. 1, 500 lbs. per acre	19	36$\frac{4}{7}$	2,043	30	40	1,880	21	7	2,023
10	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	24	1$\frac{4}{7}$	2,443	35	20	2,320	25	21$\frac{7}{8}$	2,428
11	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	22	27$\frac{4}{7}$	2,495	36	2	2,700	24	12$\frac{3}{8}$	2,521
12	Unmanured	12	17$\frac{4}{7}$	1,258	20	40	1,060	13	20$\frac{3}{8}$	1,233
13	Bone, finely ground, 500 lbs. per acre	13	27$\frac{3}{7}$	1,324	18	16	1,450	14	8	1,340
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	19	30$\frac{1}{7}$	1,980	33	16	2,240	21	16$\frac{3}{8}$	2,012
15	Nitrate of soda, 200 lbs. per acre	21	16$\frac{2}{7}$	2,638	25	20	1,600	21	40$\frac{6}{8}$	2,508
16	Muriate of potash, 150 lbs. per acre	21	17$\frac{5}{7}$	2,042	27	4	1,660	22	4	1,994
17	Sulphate of ammonia, 300 lbs. per acre	17	31$\frac{6}{7}$	2,215	20	..	1,650	17	45$\frac{7}{8}$	2,144
18	Sulphate of iron, 60 lbs. per acre	17	46$\frac{1}{7}$	1,897	21	32	1,440	18	20$\frac{3}{8}$	1,842
19	Common salt (Sodium chloride) 300 lbs. per acre	26	12	2,073	34	38	2,060	27	15$\frac{3}{8}$	2,071
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre	20	17$\frac{6}{7}$	1,842	20	20	1,390	20	18$\frac{1}{8}$	1,786
21	Mineral superphosphate No. 2, 500 lbs. per acre	20	15$\frac{5}{7}$	1,761	22	44	1,360	20	31$\frac{2}{8}$	1,711

OAT PLOTS.

The quantity of seed sown per acre on the oat plots was 2 bushels in 1889 and 1890; 1½ bushels in 1891, 1892 and 1893, and 2 bushels in 1894, 1895 and 1896. The varieties used were as follows: In 1889, Early English; 1890, 1891, 1892, 1893, Prize

Cluster; and 1894, 1895 and 1896, Banner. In 1896 the Banner was sown 2nd May, came up the 10th May, and was harvested 8th August, requiring from the date of sowing to maturity a period of 90 days. In every instance this year, excepting that of plot No. 12, the yield of oats has been very much above the average of the previous seven years. The crop of plot 2 fertilized with fresh barn-yard manure has again exceeded that of plot 1, treated with rotted manure and the average of the former for eight years now stands 6 bushels 19 lbs. higher than that of the latter.

EXPERIMENTS with Fertilizers on plots of Oats, $\frac{1}{20}$th acre.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Seven Years. Yield of Grain. Per acre.		Yield of Straw. Per acre	8th Season, 1896. Variety Banner. Yield of Grain. Per acre.		Yield of Straw. Per acre	Average Yield for Eight Years. Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	37	$29\frac{1}{7}$	2,817	84	14	4,590	43	23	3,039
2	Barn-yard manure, fresh, 15 tons per acre.	44	$2\frac{4}{7}$	3,163	93	18	4,400	50	$8\frac{6}{8}$	3,318
3	Unmanured	27	$2\frac{4}{7}$	1,542	51	6	2,070	30	$3\frac{1}{8}$	1,608
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	27	$3\frac{1}{7}$	1,814	56	6	2,050	30	$24\frac{6}{8}$	1,843
5	Mineral phosphate, untreated, finely ground; 500 lbs., nitrate of soda, 200 lbs. per acre	43	$10\frac{6}{7}$	2,822	72	2	2,940	46	31	2,837
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using..	36	$14\frac{4}{7}$	2,561	71	26	3,430	40	$28\frac{6}{8}$	2,670
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	38	$11\frac{4}{7}$	3,277	73	8	3,590	42	23[illegible]	3,316
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre	33	$10\frac{1}{7}$	2,399	65	20	2,740	37	11[illegible]	2,442
9	Mineral superphosphate, No. 1, 500 lbs. per acre	30	$7\frac{6}{7}$	2,031	54	24	1,960	33	9[illegible]	2,022
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	40	$4\frac{2}{7}$	2,951	65	30	2,870	43	11[illegible]	2,941
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	33	11	2,561	47	32	1,060	35	$5\frac{1}{8}$	2,373
12	Unmanured	22	$30\frac{1}{7}$	1,675	20	10	1,330	22	$19\frac{4}{8}$	1,632
13	Bone, finely ground, 500 lbs. per acre	28	$26\frac{1}{7}$	2,018	52	22	2,060	31	26	2,023
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	30	$13\frac{1}{7}$	2,072	69	24	3,390	35	$10\frac{5}{8}$	2,237
15	Nitrate of soda, 200 lbs. per acre	40	$\frac{5}{7}$	2,682	71	6	3,030	43	$31\frac{1}{8}$	2,725
16	Muriate of potash, 150 lbs. per acre	30	30	2,247	53	8	2,390	33	23	2,265
17	Sulphate of ammonia, 300 lbs. per acre	38	$15\frac{6}{7}$	3,251	66	6	2,560	41	$30\frac{3}{8}$	3,165
18	Sulphate of iron, 60 lbs. per acre	30	$4\frac{2}{7}$	2,169	64	24	2,500	34	$15\frac{3}{8}$	2,210
19	Common salt (Sodium chloride) 300 lbs. per acre	28	$33\frac{4}{7}$	2,034	65	..	1,960	33	$16\frac{6}{8}$	2,025
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre	29	$5\frac{2}{7}$	2,186	45	20	1,790	31	$7\frac{7}{8}$	2,137
21	Mineral superphosphate, No. 2, 500 lbs. per acre	26	31	1,920	52	12	1,950	30	$3\frac{1}{8}$	1,924

CORN PLOTS.

The experiments with the plots of Indian corn have been conducted with the object of obtaining the largest weight of well matured green fodder for the silo and to have the corn so far advanced when cut that the ears shall be in the late milk or glazed condition. Each plot has been divided from the outset into two equal parts, on one of which—known as No. 1—one of the stronger growing and somewhat later ripening sorts has been tried, and on the other, marked No. 2, one of the earlier maturing varieties. During the first four years one of the dent varieties was tested under No. 1. The Mammoth Southern Sweet was tried in 1888. 1889 and 1890. In 1891 the Red Cob Ensilage was used. and in 1892, 1893, 1894, 1895 and 1896 a free growing flint variety, the Rural Thoroughbred White Flint. was tested. On the other half of the plot (No. 2) the Canada Yellow Flint was used in 1888, 1889 and 1890, the Thoroughbred White Flint in 1891, Pearce's Prolific in 1892, 1893 and 1894, and the Mammoth Eight Rowed Flint in 1895 and 1896. For the first four years the No. 1 series was planted in drills three feet apart, using about 24 pounds of seed to the acre and thinning the plants, when up, to 6 or 8 inches apart, and the No. 2 in hills 3 feet apart each way and 4 or 5 kernels in a hill. During the past five years both sorts have been grown in hills. The corn in both series of plots was planted in 1896 on 20th May, and cut 16th September. In most instances the yield of fodder on these plots during the past season has been below the average of past years.

With Indian corn the rotted manure has given in both plots a larger return this year than the fresh manure. in plot 1 by 350 pounds per acre, and in plot 2, 980 pounds, but the average of nine years tests still shows the fresh manure in advance of the rotted in plot 1 by 2 tons, 567 pounds per acre, while in plot 2 the advantage is with the rotted manure by 932 pounds per acre.

EXPERIMENTS with Fertilizers, on plots of Indian Corn, $\frac{1}{10}$ acre each, cut green for Ensilage.

No. of Plot.	Fertilizers applied each year.	Average Yield for Eight Years. ½ Plot No. 1—weight of green fodder. Per acre.		½ Plot No. 2—weight of green fodder. Per acre		9th Season, 1896. ½ Plot No. 1—Thoroughbred White Flint, weight of green fodder. Per acre.		½ Plot No. 2—Mamm. 8 rowed, weight of green fodder. Per acre		Average Yield for Nine Years. ½ Plot No. 1—weight of green fodder. Per acre.		½ Plot No. 2—weight of green fodder. Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
1	Barn-yard manure, well rotted, 12 tons per acre	15	1,044	11	1,568	16	200	14	420	15	1,172	12	107
2	Barn-yard manure, fresh, 12 tons per acre	18	225	11	642	15	1,850	13	1,440	17	1,739	11	1,175
3	Unmanured	9	551	6	622	3	1,800	4	1,020	8	1,356	5	1,866
4	Mineral phosphate untreated, finely ground, 500 lbs. per acre in 1888—800 lbs. per acre each year since	7	1,617	5	565	3	890	3	1,190	7	647	5	190
5	Mineral phosphate untreated, finely ground, 500 lbs. per acre in 1888—800 lbs. per acre each year since; nitrate of soda, 200 lbs. per acre	11	1,961	8	857	5	520	9	810	11	467	8	1,074
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre; composted together, intimately mixed and allowed to heat for several days before using	16	1,675	11	1,483	14	460	10	1,780	16	1,095	11	1,293
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	15	1,245	10	1,198	12	1,080	11	920	15	560	10	1,389

EXPERIMENTS with Fertilizers on plots of Indian Corn, $\frac{1}{10}$th acre each, &c.—*Continued.*

No. of Plot.	Fertilizers applied each year.	Average Yield for Eight Years. ½ Plot No. 1—weight of green fodder. Per acre.		Average Yield for Eight Years. ½ Plot No. 2—weight of green fodder. Per acre.		9th Season, 1896. ½ Plot No. 1—Thoroughbred White Flint, weight of green fodder. Per acre.		9th Season, 1896. ½ Plot No. 2—Mamm. 8 rowed, weight of green fodder. Per acre.		Average Yield for Nine Years. ½ Plot No. 1—weight of green fodder. Per acre.		Average Yield for Nine Years. ½ Plot No. 2—weight of green fodder. Per acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre......	12	383	8	1,111	9	660	7	1,950	11	1,747	8	982
9	Mineral superphosphate, No. 1, 500 lbs. per acre........	11	790	8	502	7	1,210	6	1,840	10	1,947	8	206
10	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	14	515	10	1,156	10	1,740	10	120	13	1,762	10	1,040
11	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	16	749	12	790	13	1,500	12	400	16	165	12	746
12	Unmanured....	11	1,333	9	968	6	1,960	6	1,570	11	291	9	368
13	Bone, finely ground, 500 lbs. per acre	12	1	8	1,915	9	1,800	9	760	11	1,534	9	8
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	12	651	8	1,712	11	350	8	640	12	284	8	1,592
15	Nitrate of soda, 200 lbs. per acre...	13	1,601	10	732	7	1,920	7	1,340	13	303	10	132
16	Sulphate of ammonia, 300 lbs. per acre.	14	351	10	343	8	410	9	480	13	1,024	10	136
17	Mineral superphosphate No. 1, 600 lbs.; muriate of potash, 200 lbs.; sulphate of ammonia, 150 lbs. per acre.....	13	216	9	586	12	300	9	1,640	13	3	9	703
18	Muriate of potash, 300 lbs. per acre..	9	1,171	5	1,927	7	200	6	520	9	618	5	1,992
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and '90; (muriate of potash, 200 lbs., substituted each year since); dried blood, 300 lbs.; mineral superphosphate No. 1, 500 lbs. per acre	11	1,087	7	1,574	12	500	8	1,700	11	1,244	7	1,800
20	Wood ashes, unleached, 1,900 lbs. per acre..............	10	850	6	1,716	8	810	8	1,020	10	401	7	83
21	Bone, finely ground, 500 lbs.; sulphate of ammonia, 200 lbs.; muriate of potash, 200 lbs. per acre....	13	735	8	1,596	12	1,830	11	1,630	13	634	9	266

PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under so that the plant food they have taken from the soil may be returned to it. One-half of each one-tenth acre plot in the series has been devoted to the growth of mangels, and the other half to turnips. The preparation of the land has been the same for both these roots. It has been ploughed in the autumn after the crop is gathered, disc-harrowed or gang-ploughed once in the spring, harrowed with smoothing harrow once, then ridged, rolled and sown.

In 1889, the variety of mangel used was the Mammoth Long Red. In 1890, three varieties were sown: 15 rows of Mammoth Long Red, 6 of Mammoth Long Yellow, and 6 of Golden Intermediate on each plot. In 1891, each plot again had three varieties: 18 rows of Mammoth Long Red, 3 of Yellow Fleshed Tankard, and 6 of Golden Tankard. In 1892, 1893, 1894, 1895 and 1896 one variety only has been used, namely, the

Mammoth Long Red. From 4 to 6 lbs. of seed have been sown per acre, each year, in rows 2½ feet apart. In 1896 the mangels were sown 11th May, came up 19th May, and were pulled 14th October.

Two varieties of turnips were sown on the half plots devoted to these roots in 1889: 25 rows of Carter's Prize Winner, and 2 rows of Carter's Queen of Swedes; and in 1890, a single variety: Carter's Elephant Swede. In 1891, six varieties were sown; 6 rows of Lord Derby Swede, 4 of New Giant King, 3 of Imperial Swede, 6 of Champion Swede, 4 of Purple Top Swede, and 4 of East Lothian Swede. In 1892, the Improved Purple Top Swede only was sown, in 1893 and 1894 the Prize Purple Top Swede, in 1895 the Imperial Swede, and in 1896 the Prize Purple Top Swede. The land used for the turnips, which are usually sown later than the mangels, is allowed to stand after disc-harrowing or gang-ploughing, then cultivated once and ridged and rolled immediately before sowing. In 1896, the turnips were sown 12th June, came up 17th June, and were pulled 17th October. The crops of turnips have been much larger during the past season than the average of previous years, while in the case of the mangels about one half of the plots have given a larger yield than the average of the past and the other half a less return. The rotted manure has averaged better results than the fresh manure with both mangels and turnips.

EXPERIMENTS with Fertilizers on Roots; Plots of Mangels and Turnips $\frac{1}{10}$th acre each.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Seven Years.				8th Season, 1896. Varieties.				Average Yield for Eight Years.			
						East Half Plot.		West Half Plot.					
		Mangels, Weight of Roots.		Turnips, Weight of Roots.		Mangels, Mammoth Long Red: Weight of Roots.		Turnips, Purple Top Swede: Weight of Roots.		Mangels, Weight, of Roots.		Turnips, Weight of Roots.	
		Per Acre.		Per Acre.		Per Acre.		Per Acre.		Per Acre.		Per Acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	Barn-yard manure, well rotted, 20 tons per acre..............	21	1,586	12	137	26	1,300	24	1,320	22	800	13	1,285
2	Barn-yard manure, fresh, 20 tons p. ac.	21	683	13	153	24	1,970	23	1,840	21	1,594	14	864
3	Unmanured........................	9	947	6	890	9	840	12	1,150	9	933	7	422
4	Mineral phosphate, untreated, finely ground, 1,000 lbs. per acre........	8	1,716	6	1,470	7	1,340	11	1,340	8	1,419	7	704
5	Mineral phosphate, untreated, finely ground, 1,000 lbs.; nitrate of soda, 250 lbs.; wood ashes, unleached, 1,000 lbs. per acre	13	1,090	7	462	11	1,430	18	720	13	632	8	1,244
6	Barn-yard manure, partly rotted and actively fermenting, 12 tons per acre; mineral phosphate, untreated, finely ground, 1,000 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using..... ...	17	1,699	11	304	19	1,670	20	930	18	196	12	632
7	Mineral phosphate, untreated, finely ground, 1,000 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890, (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years;) nitrate of soda, 200 lbs. per acre...	10	507	7	1,831	6	1,800	14	1,160	9	1,668	8	1,497
8	Mineral superphosphate, No. 1, 500 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890, (substituted by muriate of potash, 250 lbs, in 1891 and subsequent years:) nitrate of soda, 200 lbs. per acre.......	14	1,407	11	287	15	1,180	15	160	14	1,628	11	1,271
9	Mineral superphosphate, No. 1, 500 lbs. per acre...........	9	1,268	8	362	10	1,880	12	1,930	9	1,594	8	1,558

EXPERIMENTS with Fertilizers on Roots; Plots of Mangels and Turnips—*Concluded.*

No. of Plot.	Fertilizers applied each Year.	Average Yield for Seven Years. Mangels. Weight of Roots. Per Acre.	Average Yield for Seven Years. Turnips, Weight of Roots. Per Acre.	8th Season, 1896. Varieties. East Half Plot. Mangels, Mammoth Long Red: Weight of Roots. Per Acre.	8th Season, 1896. Varieties. West Half Plot. Turnips, Purple Top Swede: Weight of Roots. Per Acre.	Average Yield for Eight Years. Mangels, Weight of Roots. Per Acre.	Average Yield for Eight Years. Turnips, Weight of Roots. Per Acre.
		Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.
10	Nitrate of soda, 300 lbs. per acre...	14 422	7 1,250	17 720	15 1,690	14 1,209	8 1,305
11	Sulphate of ammonia, 300 lbs. per ac.	11	8 1,674	15 1,450	18 780	11 1,181	10 62
12	Unmanured............	7 877	6 1,226	9 880	9 1,170	7 1,377	6 1,968
13	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,000 lbs. per acre	10 673	7 217	11 1,620	14 1,800	10 1,041	8 165
14	Wood ashes, unleached, 2,000 lbs. p.ac	11 1,790	7 536	9 240	12 1,580	11 1,096	7 1,916
15	Common salt (Sodium chloride) 400 lbs. per acre....................	10 1,074	7 147	6 1,240	10 1,060	10 95	7 1,011
16	Mineral superphosphate, No. 1, 500 lbs.; nitrate of soda, 200 lbs. per ac.	13 1,822	10 181	12 1,960	14 700	13 1,589	10 1,226
17	Mineral superphosphate, No. 1, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	12 1,367	8 1,688	12 1,750	15 130	12 1,415	9 1,243
18	Mineral superphosphate, No. 1, 500 lbs.; muriate of potash, 200 lbs. p.ac.	12 1,287	9 1,418	10 250	16 340	12 657	10 1,033
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890; (muriate of potash, 200 lbs., substituted each year since;) dried blood, 250 lbs.; mineral superphosphate, No. 1, 500 lbs. per acre.....	14 961	10 458	12 1,220	19 1,320	14 493	11 816
20	Wood ashes, unleached, 1,500 lbs.; common salt (Sodium chloride) 300 lbs. per acre....................	14 1,935	9 1,405	12 1,980	16 580	14 1,440	10 1,052
21	Mineral superphosphate, No. 2, 500 lbs. per acre....................	15 1,555	9 1,398	13 300	19 680	15 898	10 1,808

CARROT PLOTS.

Carrots have been sown on alternate halves of the oat plots for the past six years, for the purpose of cleaning the land from weeds. This work was begun in 1891, and the plots have been sown each year with the variety known as the Improved Short White. In 1896, carrots occupied the west half of the plots. The seed was sown 5th May, came up 14th May, and the roots were pulled 19th October. The crop this year on all the plots excepting No. 1 was below the average of the preceding years.

EXPERIMENTS with Fertilizers on half plots (one-twentieth acre) of Carrots (Improved Short White), after Oats.

No. of Plot.	Fertilizers applied each year.	Average Yield for five years. Weight of roots per acre.		6th Season Improved Short White. Weight of roots per acre.		Average Yield for six years. Weight of roots per acre.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	18	930	21	600	18	1,875
2	Barn-yard manure, fresh, 15 tons per acre	20	1 212	19	1,960	20	1,003
3	Unmanured	14	216	7	860	12	1,990
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	13	1,552	10	1,310	13	511
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre	16	1,018	12	710	15	1,633
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed, and allowed to heat for several days before using	19	756	17	590	19	61
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs., per acre	15	814	13	1,760	15	305
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1, 500 lbs. per acre	12	940	10	1,370	12	345
9	Mineral superphosphate, No. 1, 500 lbs. per acre	10	466	8	460	9	1,798
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	12	950	9	1,740	12	81
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	16	864	11	640	15	1,160
12	Unmanured	12	1,604	3	1,230	11	541
13	Bone, finely ground, 500 lbs. per acre	13	856	5	820	12	183
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	18	740	15	80	17	1,630
15	Nitrate of soda, 200 lbs. per acre	16	1,035	8	980	15	359
16	Muriate of potash, 150 lbs. per acre	17	624	12	1,440	16	1,093
17	Sulphate of ammonia, 300 lbs. per acre	12	588	5	1,050	11	331
18	Sulphate of iron, 60 lbs. per acre	13	408	6	1,000	12	173
19	Common salt (Sodium chloride), 300 lbs. per acre	15	84	8	1,990	14	68
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre	14	1,886	11	1,000	14	738
21	Mineral superphosphate, No. 2, 500 lbs. per acre	12	1,246	7	920	11	1,525

POTATO PLOTS.

The alternate halves of the wheat and barley plots which were occupied by carrots and sugar beets in 1891, 1892 and 1893, were planted with potatoes in 1894, 1895 and 1896. These were planted in rows $2\frac{1}{2}$ feet apart, with the sets about 1 foot apart in the rows.

Those grown in 1896 after wheat were planted 12th May, came up 3rd June, and were dug 5th October. On each of these plots there were seven rows of Early Rose and five rows each of Queen of the Valley, Daisy, Early Sunrise, and May Queen Early.

Those grown after barley were planted 11th May, came up 2nd June, and were dug 30th September. On each of these plots there were seven rows of Burpee's Extra Early, and five rows each of Wonder of the World, Beauty of Hebron, Thorburn and Lee's Favourite. In the tables following the yield of each variety for each plot is given, also the crop in bushels per acre.

The weight of tubers dug of each variety per row as far as they have been tested, five of them for three years, four for two years, and one for one year, are here submitted, arranged in the order of their yield in 1896.

VARIETIES of Potatoes.

Name of Variety.	1896.	1895.	1894.	Average for the whole period.
	Lbs.	Lbs.	Lbs.	Lbs.
Early Sunrise	367	407	...	387
Queen of the Valley	358	462	...	410
Thorburn	351	329	357	346
Beauty of Hebron	308	257	406	323
Lee's Favourite	295	284	333	304
Early Rose	294	426	235	318
Burpee's Extra Early	276	.....	......	276
Daisy	268	376	......	322
May Queen Early	259	269	......	264
Wonder of the World	247	344	406	332

These variations in yield from year to year of the same variety grown under what appears to be precisely similar conditions of soil and treatment, serve to show the folly of forming hasty conclusions on the tests of a single year.

EXPERIMENTS with Fertilizers on half plots ($\frac{1}{20}$ acre) of Potatoes after Wheat.

No. of Plot.	Fertilizers Applied Each Year.	East Half of Plots. Yield of 7 rows Early Rose.	Yield of 5 rows Queen of the Valley.	Yield of 5 rows Daisy.	Yield of 5 rows Early Sunrise.	Yield of 5 rows May Queen Early.	Total Yield per Acre.	
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Bush.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year since	238	185½	151½	179½	154	302	50
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year since	213½	166	141	166½	123½	270	10
3	Unmanured	74	57½	44	51½	43	90	
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	61	47	33	65½	47½	84	40
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre	67½	55½	50	61	48	94	
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed, and allowed to heat for several days before using	195	154	155	136	129	256	20
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	144	102½	70	95	83½	165	
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	115½	85	63	84½	52½	133	50
9	Mineral superphosphate, No. 1, 500 lbs. per acre	88	81½	72	95½	53	130	
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	83½	73½	61½	83	57	119	50
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	120	122	107	129½	68	182	30
12	Unmanured	45½	49	39½	65½	33½	77	40
13	Bone, finely ground, 500 lbs. per acre	66½	52	33½	67	37½	85	50
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	139	119	69½	128½	72	176	
15	Nitrate of soda, 200 lbs. per acre	66	78	36½	84½	51	105	30
16	Muriate of potash, 150 lbs. per acre	96	90½	58	83	67½	131	40
17	Sulphate of ammonia, 300 lbs. per acre	56½	54½	23½	41	33	69	50
18	Sulphate of iron, 60 lbs. per acre	48½	58½	26½	43	30	69	10
19	Common salt (Sodium chloride), 300 lbs. per acre	31	36	22	46	22½	52	50
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre	57½	55	39	58	39	83	10
21	Unmanured in 1889, mineral superphosphate, No. 2, 500 lbs. per acre each year since	52	69	41	71½	53	95	50

EXPERIMENTS with Fertilizers on Half-Plots ($\frac{1}{20}$ acre) of Potatoes after Barley.

No. of Plot.	Fertilizers applied each Year.	West half of Plots.						
		Yield of 5 rows Wonder of the World.	Yield of 5 rows Thorburn.	Yield of 5 rows Beauty of Hebron.	Yield of 5 rows Lee's Favourite.	Yield of 5 rows Burpee's Extra Early.	Total Yield per acre.	
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Bush.	lbs.
1	Barn-yard manure, well rotted, 15 tons per acre...	137½	148½	142	136	197½	253	50
2	Barn-yard manure, fresh, 15 tons per acre....	126½	119½	133	127½	195½	233	40
3	Unmanured	51½	53½	56½	61	77	99	50
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	58½	64½	66½	59	46	98	10
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre.	54	62½	65	52½	62½	98	50
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	110½	122	123½	109	135	196	40
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	49	87½	82	83	104½	135	20
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	35	101	64½	84	100½	128	20
9	Mineral superphosphate, No. 1, 500 lbs. per acre	60½	111	81	82	108½	147	40
10	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre.	41½	66½	44	67½	80	99	50
11	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	92	132	114	111	131½	193	30
12	Unmanured	15½	60½	26	64	74	80	
13	Bone, finely ground, 500 lbs. per acre	22½	43	31½	38	57	64	
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	77	95½	80½	81	101	115	
15	Nitrate of soda, 200 lbs. per acre	41½	59	66	40	60	88	50
16	Muriate of potash, 150 lbs. per acre	62½	91½	74½	60½	68½	119	10
17	Sulphate of ammonia, 300 lbs. per acre	27	31½	27½	25½	53	54	50
18	Sulphate of iron, 60 lbs. per acre	26	61½	35	35	58	71	50
19	Common salt (Sodium chloride) 300 lbs. per acre	45½	87½	66	55	73	109	
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre	62½	56	82	51	69½	107	
21	Mineral superphosphate No. 2, 500 lbs. per acre	38½	102½	81½	55	80	119	16

SUMMARY of Crops grown on the Central Experimental Farm during the year 1896.

—	Tons.	Lbs.	—	Bushels.	Lbs.
Hay	134		Wheat	129	34
Indian corn cut for ensilage	322	865	Oats	3,019	26
Horse beans cut for ensilage	8	275	Barley	801	39
Sunflower heads cut for ensilage	12	145	Pease	198	51
Turnips	62	1,005	Potatoes	505	16
Carrots	105	1,590		4,654	46
Mangels	95	1,229			
Sugar beets	3	1,680			
	744	789			

DISTRIBUTION OF SEED GRAIN.

Another distribution of seed grain was made in the spring of 1896, consisting chiefly of samples of the most promising sorts which have been grown at the several experimental farms. These have been sent out to farmers on application, as a rule one sample only to each applicant, the object in view being to place within their reach pure samples and true to name of the best and most prolific varieties in cultivation. By the careful handling of these samples the farmer can soon produce sufficient seed for a large area and may thus be provided with the best of seed at no cost but that of his own labour. The appreciation of this work is shown by the demand for these samples which is increasing every year. Last year the number of applications received was about 40,000 and the available stock was sufficient to supply samples to about 35,000 applicants.

Preparations have been made for another distribution in 1897 which will consist as heretofore of promising sorts of oats, barley, wheat, pease, corn and potatoes. The several branch farms will also again distribute samples to farmers residing in the provinces and territories where these institutions have been established.

The samples sent out from the Central Experimental Farm at Ottawa during the early months of 1896 were distributed as follows:—

Kind of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	North-west Territories.	British Columbia.
Oats	520	1,014	1,143	5,181	4,161	277	203	575
Barley	203	463	340	2,974	1,356	97	81	265
Wheat	326	484	468	2,173	1,750	123	93	262
Pease	180	364	395	917	1,267	72	90	203
Corn	100	153	198	446	393	17	8	34
Potatoes	117	384	211	1,209	934	85	110	26
Total number of samples sent.	1,446	2,862	2,755	12,900	9,861	671	585	1,365
Number of applicants supplied	1,411	2,843	2,751	12,765	9,810	668	580	1,352

The following list shows the number of three-pound packages of the different varieties which have been distributed.

Oats.	
Banner	3,289
Wallis	3,165
Abundance	2,063
Bavarian	1,484
Early Gothland	1,030
Golden Giant	486
Winter Grey	327
Oderbruch	276
Poland	253
Siberian	205
Victoria Prize	195
Golden Beauty	86
Rennie's Prize,	81
Flying Scotchman	134
Total	13,074

Pease.	
Mummy	1,241
Black-eyed Marrowfat	812
Daniel O'Rourke	817
Prussian Blue	369
Pride	133
Canadian Beauty	116
	3,488

Corn.	
Mammoth Eight-rowed Flint	758
Thoroughbred White Flint	391
Champion White Pearl	200
	1,349

Barley, Six-rowed.	
Odessa	3,929
Mensury	416
Oderbruch	389
Trooper	106
Total	4,840

Barley, Two-rowed.	
Canadian Thorpe	939

Wheat.	
Red Fife	3,150
White Connell	1,876
White Fife	211
Wellman's Fife	174
Ladoga	167
Crown	101
Total	5,679

Potatoes.	
Wonder of the World	512
Daisy	334
Everett	370
Early Sunrise	302
Thorburn	295
Dakota Red	255
London	169
Lee's Favourite	138
Burpee's Extra Early	139
May Queen Early	109
Vanier	151
Empire State	95
Early Ohio	88
Rural Blush	74
Beauty of Hebron	45
	3,076

Total number of samples distributed, 32,445.
Number of applicants supplied, 32,170.

DISTRIBUTION OF CROSS-BRED AND HYBRID CEREALS.

A second distribution of some of the more promising of the cross-bred and hybrid cereals was made during the past season. Several of these were included to some extent in the general distribution in 3 lb. bags, but the larger number were sent out in 1 lb. bags for the reason that the quantities available were not sufficient for a more liberal distribution. The number of these packages which were sent to the several provinces was as follows:—

Kind of Grain.	Prince Edward Island.	New Brunswick.	Nova Scotia.	Quebec.	Ontario.	Manitoba.	North-west Territories.	British Columbia.
Cross-bred wheats	46	137	182	307	438	31	37	9
Hybrid barleys	54	176	204	308	535	22	38	10
Cross-bred pease	18	38	40	133	222	25	22	12
	118	351	426	748	1,195	78	97	31

This makes a total number of 3,044 samples.

The total number of samples distributed from the Central Experimental Farm for test during 1896 was 35,489.

DISTRIBUTION OF SAMPLES FROM BRANCH EXPERIMENTAL FARMS.

Samples were also distributed from the branch experimental farms as follows:—

Experimental Farm, Nappan, N.S.

Oats	133
Barley	67
Wheat	51
Pease	53
Rye	6
Potatoes	155
	465

Number of applicants supplied, 264.

Experimental Farm, Brandon, Man.

Grain of all kinds in 3-lb. bags	348
Potatoes	94
	442

Experimental Farm, Indian Head, N.W.T.

Oats	448
Barley	342
Wheat	267
Pease	93
Rye	25
Flax	12
Potatoes	463
	1,650

Experimental Farm, Agassiz, B.C.

Oats	71
Barley	75
Spring Wheat	41
Fall Wheat	24
Pease	84
Potatoes	38
	333

This makes a total of 2,890 samples sent out by the branch experimental farms which, added to the number distributed by the Central Farm, makes a total of 38,379 samples. This branch of the farm work is greatly appreciated, and through this means some of the better varieties are rapidly finding their way into general cultivation.

TEST OF THE VITALITY OF GRAIN AND OTHER SEEDS.

The number of samples of seed grain and other seeds which were tested for their germinating power during the season of 1896 was 1,793. The following figures show the variations in the average vitality of the more important cereals during the past four years :—

	1893.	1894.	1895.	1896.
Wheat	81·8	90·5	88	87·7
Barley	84·9	89	85·7	90·1
Oats	93	95·5	93·3	89·8

The appended results prove that there were samples of wheat, barley and oats included in these tests which showed so low a degree of vitality as to be utterly worthless for seed purposes, hence the desirability of having doubtful samples tested. A small quantity of the seed is all that is needed for this trial, and the tests of vitality can usually be completed and reported on within a fortnight after the grain is received. This work is done without charge and samples can be sent to the Central Experimental Farm at Ottawa free by mail.

Results of Tests of Seeds for vitality, 1895–96.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	477	100·0	3·0	81·0	6·7	87·7
Barley	305	100·0	7·0	80·1	10·0	90·1
Oats	501	100·0	1·0	84·7	5·1	89·8
Rye	1	81·0	81·0			81·0
Pease	102	92·0	8·0			64·0
Corn	17	100·0	16·0			81·3
Clover	6	87·0	54·0			73·1
Grass	16	100·0	23·0			67·9
Sunflowers	8	98·0	84·0			92·7
Turnips	29	98·0	3 0			70 2
Carrots	29	84·0	1·0			46·3
Mangels	20	74·0	18·0			44·9
Beet	16	84·0	32·0			61·6
Sugar beet	3	68·0	46·0			58·0
Lettuce	16	87·0	1·0			55·7
Onions	20	89·0	0·0			59·5
Leeks	6	87·0	34·0			57·1
Spinach	7	54·0	19·0			32·7
Cabbage	37	93·0	1·0			65·1
Cauliflower	6	90·0	33·0			53·5
Brussels sprouts	2	78·0	43·0			60·5
Kale	1	78·0	78·0			78·0
Radish	16	88·0	6·0			55·4
Sweet Pease	13	98·0	12·0			67·0
Celery	15	69·0	1·0			30·4
Parsnips	5	76·0	42 0			61·4
Tomatoes	23	91·0	13·0			53·0
Pepper	8	58·0	4·0			29·5
Cucumber	12	76·0	20·0			44·1
Melon	13	56·0	6·0			29·8
Water Melon	12	74·0	8·0			41·8
Squash	15	88·0	0·0			30·2
Parsley	3	53·0	13·0			29·3
Pumpkin	3	64·0	0·0			30·6
Tobacco	4	68·0	21·0			45·5
Horse Beans	2	86·0	34·0			60·0
Salsify	2	61·0	52·0			56·5
Endive	2	28·0	19·0			23·5
Cress	2	90 0	83·0			86·5
Chervil	2	35·0	31·0			33·0
Thyme	3	15·0	4·0			10·3
Summer Savory	2	39·0	37·0			38·0
Sweet Marjoram	2	22·0	11·0			16·5
Sage	1	5·0	5·0			5·0
Horehound	1	1·0	1·0			1·0
Canary Seed	1	56·0	56·0			56·0
Coriander	1	92·0	92·0			92·0
Mustard	1	95·0	95·0			95·0
Mignonette	1	23·0	23·0			23·0
Rhubarb	1	84·0	84·0			84·0
Tares	1	86·0	86·0			86·0
Flax	1	90·0	90·0			90·0
Total number of samples tested, highest and lowest percentage.	1,793	100·0	0·0			

TABLE showing Results of Grain Tests for each Province.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
ONTARIO.						
Wheat	146	100·0	0·0	71·1	9·0	80·1
Barley	89	100·0	0·0	77·1	12 6	89·7
Oats	133	100·0	86·0	95·4	2·3	97·7
QUEBEC.						
Wheat	71	100·0	73·0	88·3	4·0	92·3
Barley	86	100·0	39·0	80·1	8·7	88·8
Oats	102	100·0	75·0	92·2	4·2	96·4
MANITOBA.						
Wheat	72	100·0	41·0	87·3	5·5	92·8
Barley	38	100·0	7·0	83·1	9·5	92·6
Oats	54	100·0	40·0	87·0	5·4	92·4
NORTH-WEST TERRITORIES.						
Wheat	84	100·0	3·0	77·1	9·4	86·5
Barley	51	100·0	7·0	81·6	10·2	91·8
Oats	141	99·0	1·0	65·3	7·9	73·2
NOVA SCOTIA.						
Wheat	45	100·0	61·0	88·1	4·1	92·2
Barley	20	100·0	53·0	81·2	7·5	88·7
Oats	36	100·0	85·0	91·0	5·0	96·0
NEW BRUNSWICK.						
Wheat	32	100·0	73·0	90·2	3·3	93·5
Barley	12	100·0	44·0	76·3	9·7	86·0
Oats	24	100·0	68·0	89·8	5·6	95·4
PRINCE EDWARD ISLAND.						
Wheat	18	99·0	79·0	87·9	3·6	91·5
Barley	5	100·0	84·0	88·6	5·4	94·0
Oats	11	100·0	87·0	92·2	5·3	97·5
BRITISH COLUMBIA.						
Wheat	9	100·0	85·0	86·7	5·7	92·4
Barley	4	99·0	92·0	93·5	2·5	96·0
Oats	0	.....	.....	.....	.....	.....

METEOROLOGICAL OBSERVATIONS.

Table of Meteorological Observations taken at the Central Experimental Farm, Ottawa, 1896 : maximum, minimum and mean temperature for each month, with date of occurrence, also rainfall and snowfall :—

Months.	Maximum.	Date.	Minimum.	Date.	Mean.	Rainfall.	Snowfall.	No. of days Precipitation.
	°		°		°	In.	In.	
January	38·6	2	—25·0	6	11·9	0·00	23·00	15
February	43·0	28	—30·7	17&18	12·2	0·32	37·50	17
March	45·0	30	— 9·2	24	17·6	1·45	18·25	15
April	82·8	19	13·0	4	41·5	0·81	2·75	11
May	90·5	9	37·1	1	63·6	2·26	....	13
June	87 4	5	42 5	30	66·9	3·43	....	9
July	92·8	2	48·5	24	70·4	3·03	....	11
August	92·1	11	41·0	29	68·7	3·91	....	13
September	89·0	11	30·0	23	57·1	3·42	....	14
October	64·0	15	25·8	17	43 1	1·19	0·50	11
November	59·2	18	8·2	23	34·5	1·79	5·25	21
December	41·0	6	—15·0	22	17·8	0·00	12·50	16
						21·53	99·75	166

Rain or snow fell on 166 days during 12 months.

Heaviest rainfall in 24 hours, 1·96 inches on June 9.

Heaviest snowfall in 24 hours, 15 inches on February 25.

It will be seen the highest temperature during the 12 months was 92·8 on July 2, and 92°·1 on August 11.

The lowest temperature during the 12 months was —30°·7 on February 17 and 18.

During the growing season rain fell on 13 days in the months of May and August, and on 14 days in September.

June shows the lowest number of days on which rain fell, viz., 9.

Rain or snow fell on 21 days in November.

WILLIAM T. ELLIS,
Observer.

EXPERIMENTS IN CROSS-FERTILIZING TO PRODUCE FRUITS SUITABLE FOR THE CANADIAN NORTH-WEST.

It will no doubt interest many of our readers, more especially those residing in Manitoba and the North-west Territories, to know the nature and the progress of the work which is now being carried on with the hope of producing sooner or later, varieties of apples, plums and cherries, which will be sufficiently hardy to endure the climate and produce fruit of such size and quality as will be useful to the settlers occupying those portions of the Dominion. In the spring of 1890, as soon as the branch experimental farms were established in the Canadian North-west, experiments were begun in the testing of fruits, and during the past six years almost every variety of fruit tree obtainable, which had any special claim for hardiness, has been tried both at Brandon and Indian Head. These have consisted of selections embracing all the hardier forms grown in the eastern parts of the Dominion, in the western and northern parts of the United States and in the northern countries of Europe. A very full selection of Russian varieties has also been obtained partly from importations made by the late Chas. Gibb of

Abbotsford, Quebec, and by Prof. J. L. Budd of Iowa, and partly by direct importation. These have been propagated by the Horticulturist at the Central Farm, Ottawa, and sent to the branch farms in the North-west in considerable quantities so as to try them under every condition as to shelter, soil, &c. Plantations were made on sites with different aspects, on the open prairie, in clearings made in the natural scrub growth on the bluffs and in the shelter of forest belts and hedges, but after seven years of persistent trial including tests of about three hundred of the most promising varieties, and of several thousand trees in all, not a tree remains from which there is any reasonable hope of obtaining fruit in satisfactory quantity.

Fig. 9.—Branch of *Pyrus baccata* with fruit.

There is, however, one variety of crab, a very hardy sort from Siberia, known as the berried pyrus, *Pyrus baccata* which has endured the climate for the past five years without injury, starting each spring from the terminal buds, both at Brandon and Indian Head. This crab fruits very freely but it is very small, not much larger than a cherry. Fig. 9 represents a small branch of this tree in fruit, from a photograph half natural size. Efforts are being made to improve this fruit in size and quality by cross-fertilizing it with many of the hardiest sorts of apples and the larger crabs. This work of crossing was begun in the spring of 1894, part of the work was done by the Director, but the greater part by Dr. C. E. Saunders, and the following varieties were used in making these crosses: Duchess, Wealthy, Tetofsky, MacMahan White, Anis and Red Anis apples, and Hyslop, Transcendant and Orange crabs. The seeds obtained from the fruits which had been crossed were sown in the autumn of 1894, and came up in the spring of 1895. The young trees were well cared for and most of them made strong growth, they were taken up from the seed beds in the spring of 1896 to the number of 175 and planted at the Central Farm in a closely set orchard for test. *Pyrus baccata* is a vigorous grower, but is dwarf in habit with its branches extending close to the ground. Trees planted seven years ago at the Central Farm at Ottawa, the second year from seed now stand from 8 to 9 feet high, are very sturdy and thickly set with branches. Fig. 10 shows one of these trees, literally covered with blossom, from a photograph taken last spring.

In the spring of 1896 this promising work was undertaken on a much larger scale, the services of Dr. C. E. Saunders, who is an expert in such matters, were secured, and in addition to the varieties of apples and crabs already named the following sorts were used as crosses on the *Pyrus baccata*, Red Astrachan, Yellow Transparent, Excelsior, Pewaukee, Fameuse, Mackintosh Red, Talman's Sweet, Ribston Pippin and Swayzie

Pomme Grise, also the Martha crab. As a result of this work 1,822 cross-bred seeds were procured, which were all duly planted in the autumn. From this quantity of seed 1,500 to 1,600 trees may be expected and it is proposed as soon as these have had one year's growth, that part of them be sent to Brandon and part to Indian Head where suitably inclosed plots are being prepared for them. Out of so large a number of crosses it is expected that many will be found to bear larger and improved fruits, of a hardy and suitable character. It is proposed to select the best of

Fig. 10.—Tree of *Pyrus baccata* in blossom 9 years from seed.

these varieties, and to top-graft them on the poorer sorts which will furnish hardy stocks and it is hoped that good progress will soon be made in this useful and interesting branch of work.

In order that this process of crossing may be the better understood Figure 11 has been engraved from drawings made by Dr. C. E. Saunders. *1* shows the flower of *Pyrus baccata* magnified two diameters, shortly before opening, when it is just ready for this work, *2* the same flower with the petals removed, exposing a central bunch of pistils with the stamens bearing the unripe anthers clustered below them. At *3* the

flower is shown as prepared for crossing with all the anthers, or male organs removed, both these are also magnified two diameters. *4* shows one of the stamens separated with the oval pollen bearing anther supported by the thread-like stem called a filament, this is magnified three diameters. When the anther is mature it bursts open and discharges a very fine yellow powder called pollen, which is composed of very minute oval grains one of which is shown at *5* highly magnified and resting on its side, while *6* shows an end view of the same. It is with such tiny atoms that fertilization is effected. When these pollen grains are placed on the tip of one of the pistils they emit a fine thread-like growth which penetrates the substance of this organ and lengthening extends downwards until it reaches the ovary where fructification of the undeveloped seeds takes place.

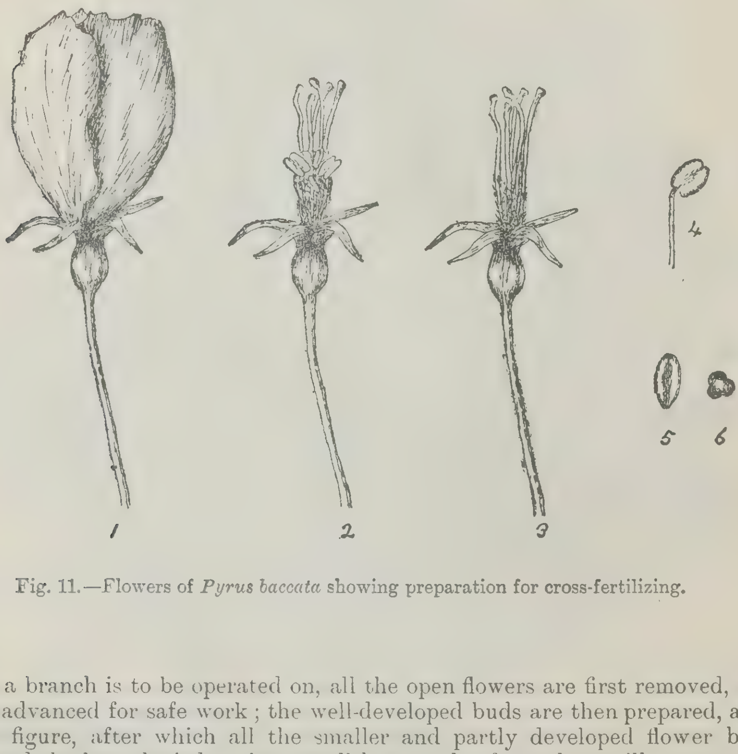


Fig. 11.—Flowers of *Pyrus baccata* showing preparation for cross-fertilizing.

When a branch is to be operated on, all the open flowers are first removed, as these are too far advanced for safe work ; the well-developed buds are then prepared, as shown at 3 in the figure, after which all the smaller and partly developed flower buds are pulled off and the branch tied up in a small bag, made of tough manilla paper, so as to prevent any possibility of the access of pollen-bearing insects or of pollen from other flowers being carried to these blossoms by currents of air. Pollen is then collected from the flowers of the variety which has been chosen for the cross and applied freely to the tips of the pistils of the flowers to be fertilized, when the branch is again tied up in the paper bag which is left on for two or three weeks, when the paper bag may be exchanged for one of gauze or muslin, within which any fruit which may have formed will find protection until mature. When ripe, the fruit should be gathered and stored for several weeks so that the seeds may be thoroughly matured, it is then cut open and the seeds separated and sown.

The berried pyrus, *P. baccata*, is subject to much variation and some of the varieties have the fruit much larger than others, advantage is being taken of these natural sports and those trees which produce the largest and best fruit have been chosen as the basis for this work of cross-fertilizing.

The sand cherry *Prunus pumila* is a native fruit having a wide distribution. It occurs on sand beaches, sand dunes and plains from the Gaspé coast westward to the Great Lakes, and on the prairies as far west and north as Prince Albert and probably much further. It is a low-growing bush about 3 or 4 feet high, with a willow-like foliage and spreading branches extending from the base. The fruit which is usually black is produced in great profusion in clusters as shown in Fig. 12, which represents a small branch from one of the seedlings grown by the Horticulturist at the Central Farm, Mr. John Craig. Mr. Craig has raised quite a number of these seedlings which vary much in size and quality. Several hundred of them were sent two years ago to the farms at Brandon and Indian Head, where plantations have been established of this fruit. Mr. Bedford has also raised at Brandon a number of seedlings from fruit found growing wild in Manitoba. As those raised from Manitoba seed, although the bushes were smaller and younger, fruited well last season, while those sent from the Central Farm bore no fruit, it is feared that eastern grown specimens may not prove perfectly hardy there.

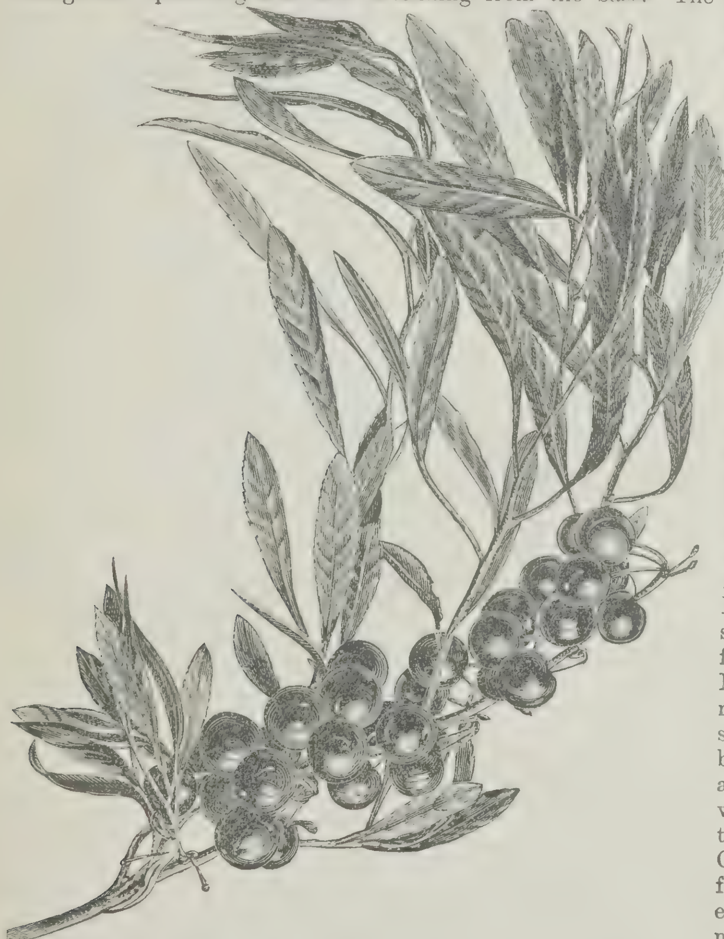


Fig. 12.—Branch of *Prunus pumila* with fruit.

Among the seedlings which fruited of those raised by Mr. Bedford there were three of superior size and merit which were thought worthy of being named. Minnie (No. 9) is a vigorous and rather upright grower, with fruit of large size and good flavour. Othello (No. 8) produces very black fruit of large size and fair flavour. Brandon (No. 6) is above medium size, of good flavour and the bush is a very abundant bearer.

Many attempts were made during the past season to cross the sand cherry with the better cultivated cherries but thus far without success. As the stone of this wild fruit bears a resemblance to that of a plum efforts were made also to cross this variety with one of the improved forms of the native plum, and in one instance this was successful and the single seed resulting has been planted. It is hoped that this work with the sand cherry will be continued and that by this means and also by a careful selection of the best seedlings such hardy cherries may shortly be available for cultivation in the North-west as will produce abundant crops of fruit of fair size and good quality. For

further information on this subject and also on the remarkable effects of grafting the sand cherry on plum stocks, the reader is referred to that part of the report written by the Horticulturist.

The wild plum *Prunus americana* is found native in many parts of Manitoba, especially in the river valleys. This fruit also varies very much in size, colour and quality, some trees producing red fruit and others yellow, some being of pleasant flavour while others are scarcely edible. Plantations have been made and are being yearly extended consisting of the best varieties of this wild plum ; all the improved sorts of the wild forms which can be found in cultivation in the North-western States are also being brought together at the North-west Experimental Farms and preparations are being made for the further improvement of this fruit by cross-fertilizing.

THE PÆONY.

The pæony is an old garden favourite which has of late years grown very much in public esteem on account of the large number of beautiful new varieties which have been produced. The herbaceous sorts are best known and have a first claim on our attention. These consist of several distinct species, the flowers of which when unimproved, are single or semi-double, but by cultivation, selection and cross-fertilizing, a large number of very fine double forms have been obtained. The Chinese pæony *P. albiflora* , a native of China and Siberia has been very much used by those who have worked on the improvement of the pæony. This flower was first introduced to cultivation about 1780, and was brought prominently into notice nearly a century ago ; a number of the first new forms having been described in the Transactions of the Linnæan Society in 1817. After this pæonies grew rapidly in favour and from 1835 to 1842 choice examples of the newly introduced sorts of that period were sold at very high figures ranging from £2 to £10 sterling each. In subsequent years, they were favoured with less public attention, but the interest has revived in them very much during the past ten years, and in the catalogues of some of the larger growers of these plants, there are now offered as many as 500 named sorts all said to be distinct varieties, varying in colour from pure white through different shades of lilac, pink, rose, carmine, violet, purple, red and crimson, and many of them are rose scented.

The herbaceous pæonies send up stout flower stems every year, which die down at the close of the season. The roots are thick, fleshy and much branched and if left undisturbed for several years, large clumps form, producing very effective masses of bloom. In the accompanying plate such a clump is shown of 3 years' growth as it appeared in one of the flower beds at the Central Experimental Farm last year. Pæonies delight in a rich, deep soil, well manured, and the roots should be planted with their crowns or buds 3 or 4 inches below the surface. A top-dressing of rotted manure in the summer is also very useful by affording nutriment and preventing evaporation, and a similar covering in winter is desirable for protection. These flowers have succeeded well at all the Experimental Farms, the period of flowering varying with the climate from late in May to near the end of June. At Indian Head, N.W.T., and at Brandon, Man., they have proved hardy and have bloomed freely for the past two years.

Another class of pæonies is known as tree pæonies. These are varieties of a shrubby pæony from China, *P. Moutan* and do not die to the ground each year as the herbaceous sorts do. These have been grown with fair success at the farm at Ottawa, when the ground has been well covered with snow during the severe weather in winter, but if exposed to low temperatures when the ground is bare they suffer more or less from winter killing. The tree pæonies are more expensive than the herbaceous sorts and are not nearly so satisfactory for general cultivation.

Clump of Herbaceous Paeonies grown at the Central Experimental Farm, Ottawa.

NOTES ON IRISES OR FLAGS.

There are few who have not paid special attention to the beautiful class of perennial plants known under the names of Irises or flags, who can form any correct idea of their great beauty and wonderful variety. Many of the most striking forms are perfectly hardy, of easy culture, and will thrive in any good garden soil, and with the protection of a little mulch in winter will endure the severe climate of the North-west country usually without injury. When once established those with creeping roots spread on either side and soon form large clumps which increase in strength and in multiplicity of bloom from year to year. A large proportion of the hardy forms of Iris bloom in the spring and early summer, but by a judicious selection of varieties the blooming period may be prolonged so as to cover most of the season.

Fig. 13.—*Iris germanica* half natural size.

The many different species and varieties belonging to this interesting group may be conveniently divided into two sections, the division being based on the character of the roots, the one having creeping fleshy rootstocks or rhizomes while the other is characterized by the presence of long bulb-like corms. Of those sorts with creeping fleshy roots there are a large number with a great diversity of form, colour and beauty of markings. The German Irises, *Iris germanica*, sometimes called bearded Irises comprise a number of varieties with large and handsome flowers, the colours of which are very varied and range through rich shades of yellow, purple, mauve, white and bronze. Figure 13 shows the specific form of this group, the colours of which are lilac, blue and purple with a yellow beard, and the flowers are slightly fragrant. This species was in full bloom at the Central Farm early in June, and continued in flower for several weeks. It blooms best if plentifully supplied with water or when planted in a moist situation. It is a native of Central and Southern Europe.

Fig. 14— Iris flavescens, half natural size.

Iris flavescens, see figure 14, is a very attractive species of a lemon yellow colour, veined lightly with purplish brown. This also belongs to the bearded sorts, the beard in this instance being orange yellow. The clusters bear from three to four flowers, and its time of blooming at Ottawa is early in June. This is a native of Eastern Europe and Western Asia.

The Florentine Iris, *Iris florentina*, another bearded form, is perhaps one of the most majestic and graceful of the whole group. The flowers are very large, of a

Fig. 15—The Florentine Iris, *Iris florentina.*

very pale lilac blue colour, partly veined with green and brown with a bright yellow beard and is sweet scented. This is a native of Southern Europe, a vigorous grower with flower stalks about two feet long and it is in bloom in Ottawa during the greater part of June. Although this is a distinct specific form yet it is classed in the Germanica group. The rhizome or root has a pleasant odour reminding one of violets. It is sold in the drug stores under the name of orris root, and forms an ingredient in some perfumes and flavouring extracts, also in tooth powders.

Fig. 16—Iris variegata, Honorabile, half natural size.

The variegated iris, *Iris variegata.* This is another of the specific forms, although usually grouped by florists with germanica. It is a handsome species, a native of Eastern Europe, of which there are about forty named varieties, most of them producing very fine flowers. That represented in figure 16 is named Honorabile and its colour is yellow with rich shadings and lines of brown. It is in full bloom in Ottawa the first or second week in June. The many varieties which have originated from this species have been mainly produced by cross-fertilizing with other related sorts.

There are many other elegant forms among the varieties with creeping roots, forming very distinct and characteristic groups. Two of these are specially worthy of mention, one is that of the fringed iris *Iris plicata* of which there are a number of beautiful varieties. These flowers have usually the ground colour white with markings of lilac, blue and other colours. One of these named Madame Chereau is probably one of the handsomest irises in cultivation, having the plaited margins of the upright petals—known as standards—of a rich azure blue. Another group to be mentioned is that of the Japanese irises. These are generally catalogued under the name of *Iris Kempferi*, but are more correctly known as *Iris lævigata.* These irises produce very large flowers often exceeding 6 inches in diameter, they are rather flat in form, but exibit a charming variety of beautiful combinations of colour. These bloom late and continue in flower during the greater part of July and present the richest hues blended in charming contrasts.

The bulbous varieties are as a class more tender, those most commonly cultivated are known as Spanish and English Irises *Iris hispanica* and *Iris xyphioides* although they are both of Spanish origin, the Spanish iris is, however, the hardier of the two. The bulbs should be planted about 3 inches below the surface and protected in the autumn, with a mulch of strawy stable manure or other light litter. They usually succeed best in a light rich sandy soil in a situation fully exposed to the sun yet protected if possible from strong winds. Sufficient drainage in autumn and winter are also important conditions. The bulbous irises are most attractive when planted in masses and are usually in the height of their bloom about the middle to the third week of June. The colours of the flowers are most brilliant and the contrasts rich and striking. The specimen represented in fig. 17 has the upright petals pale blue and the greater part of the lower ones a brilliant yellow.

The bulbs may be taken up after the leaves have withered and replanted later in the season, but we have found them to succeed best if left for two or three years in the same spot, but after three years they should be removed and planted in fresh soil.

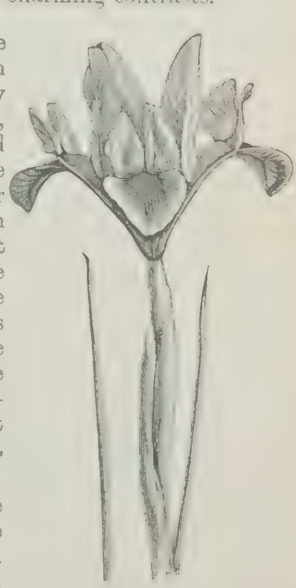


Fig. 17.—Spanish Iris *Iris hispanica*, one half natural size.

REPORT OF THE FOREMAN OF FORESTRY.

(W. T. Macoun.)

The past season has not been so favourable to the growth of trees, shrubs and flowers as several preceding years. The weather during the months of November and December, 1895, was very trying on the more tender species and varieties, as severe frosts, followed by mild weather, and this again succeeded by great cold in the early part of January, with no snow on the ground, gave them very unfavourable conditions for wintering well; notwithstanding, few trees or shrubs were killed outright, and in the spring the hardier sorts seemed little the worse for the exceptionally trying winter they had come through.

The spring was even earlier than that of 1895, and the warm weather throughout the greater part of April and May caused growth to start and leaves to expand very quickly; but these months being unusually dry, the effect of this drought was noticed on the trees and shrubs which, towards the end of May, appeared stunted in their growth and the flowers of the shrubs which bloomed at that period were not so fine as usual.

The summer was a dry one, and growth was not as vigorous on the whole as it otherwise would have been.

FOREST BELTS.

The forest belts at the Central Experimental Farm extend along its northern and western boundaries; that on the western boundary is 165 feet wide, and that on the northern boundary 65 feet; their total length being nearly 1¾ miles. The number of trees growing there, in the autumn of 1896, and in the evergreen clump, was 20,718.

The trees in the forest belts were planted to gain information along several lines, viz.:—To test the rate of growth of the various species; to gain information as to the best distance apart to plant the trees, and to ascertain the effect of planting them in blocks, each containing a single species, as compared with those in mixed belts where many species were indiscriminately introduced, all at regular distances apart. They were also planted that they might make valuable windbreaks for the farm.

Further details regarding the planting of these trees, their cultivation, growth, and general condition will be found in the reports for 1893, 1894, and 1895.

NOTES FROM THE FOREST BELTS, 1896.

Every season new and interesting features are developed in the forest belts, and many instructive lessons can now be learned by the intending forest tree planter.

There is quite a marked difference in the condition of several species of trees between those planted 5 feet and those 10 feet apart. This is especially noticeable in the Scotch pine, European larch, white birch, canoe birch, green ash, white ash, red ash, silver-leaved maple, black cherry, and box elder. Where closely planted, the lower branches to a height of from 4 to 6 feet, have died; whereas the branches of those 10 feet apart are, in most cases, still quite healthy, thus delaying the formation of timber free from knots. The trees planted 10 feet apart do not make as much terminal growth as those 5 feet apart, but the increase in diameter is greater. Injury to the leaders of the trees is more frequent and extensive where planted 10 feet apart.

During the summer, caterpillars were rather troublesome on the black cherry, American elm, black walnut, butternut, and European larch, but these were, for the most part, destroyed before much damage was done. Last winter pine grosbeaks were noticed eating the buds of the Norway spruce, the result being that a considerable number lost their terminal buds, and developed, in consequence, several leaders during the growing season.

Some of the Russian poplars are not proving a success in the forest belts. A large proportion of those planted have died of what appears to be a species of dry rot, and

View of part of the Forest Belt on the Central Experimental Farm, Ottawa.

nearly all the remainder are affected by the disease. The European alder (*Alnus glutinosa*) is evidently not adapted to this section of the country. For the past few seasons the trees have been fruiting heavily, probably a sign of weakness, and last year and again this year many of them have died. Indeed, but few healthy trees of this alder are now left.

Several species of trees have borne fruit, some of them for the past two or three years. The following were noted fruiting this season:—Box elder, black cherry, green ash, white ash, black walnut, yellow birch, white birch, canoe birch, European alder, Scotch pine, white spruce, European larch, and American arbor-vitæ.

In the report for 1895, measurements were given of many of the trees growing in the forest belts. This work has been continued during the past season and additional data procured. Measurements have also been taken of trees in the more recently planted mixed forest belts where the soil and other conditions are different from those where the trees are growing of which measurements have been already recorded.

The only part of the forest belt cultivated this year was that where the trees were planted in the autumn of 1894. Frequent cultivation was necessary there as the soil in a large part of it is rather wet, where, if neglected, sod would quickly form and be difficult to eradicate. The trees in this part of the forest belt made very satisfactory growth during the past season.

ORNAMENTAL GROUNDS.

The land adjacent to the office and other buildings, which has been devoted to the cultivation of ornamental trees and shrubs, looked better this year than ever before, although the season was unfavourable. As the trees increase in size from year to year the landscape becomes more beautiful; the effects also of the grouping are more apparent and show pleasing combinations and contrasts of colour and form. A number of the species are also beginning to bear freely their white, yellow, red, scarlet, purple, and black fruits, which still further heightens the effect produced by the judicious distribution of the various groups and single specimens which adorn this part of the grounds.

The flowering shrubs, though they looked well, were not as showy this year as usual on account of the exceptional dryness of the season. The flower borders and beds were a mass of bloom from early in the summer to late in the autumn, cannas, gladioli, and asters being particularly fine.

Each year the number of visitors to the farm increases, and the seats, distributed in shady places for the weary to sit on and rest, were well patronized during the past season. The trees also being larger cast more shade which adds to the comfort of those who use them.

During the summer, small hydrants with drinking cups attached were placed in different parts of the grounds, and these throughout the hot weather were much appreciated by many thirsty ones.

CARE OF ORNAMENTAL GROUNDS,

The work of keeping the trees and shrubs, hedges, flower borders, lawns, and roads, in good order, was greater this season than in the past as this year additions have been made to the clumps of trees and shrubs; more hedges have been planted, and some small additional areas seeded down; the flower beds made last autumn, also required attention throughout the summer. Notwithstanding this increase in the work the grounds were, with a little extra help, kept in good condition throughout the season.

ADDITIONS TO TREES AND SHRUBS ON ORNAMENTAL GROUNDS.

During last spring the work of planting was continued on the ornamental grounds and 334 trees and shrubs were added to the number already recorded. Most of this planting was done along the avenue and road from the northern entrance of the farm

to the poultry building. The trees and shrubs planted during the past two seasons now add very much to the attractiveness of this section of the farm.

Several new clumps containing 44 trees and shrubs were planted in the poultry yard for the purpose of providing shade and protection for the fowls during the summer, and of improving the appearance of the surroundings.

HEDGES.

The hedges were much admired this year by the visitors to the farm, few of whom seemed to have any idea that so many trees and shrubs could be used for this purpose. The hedges were clipped twice during the season, once in the latter part of June when most of the year's growth had been made, and again in September. Descriptions of a number of these hedges will be found in the report of the Director for 1894. Of those planted last year the following died during the winter of 1895-96 :—*Cotoneaster buxifolia*, *Cotoneaster microphylla*, *Cotoneaster nepalensis*, *Cotoneaster Simonsii*, and *Quercus palustris*, leaving 61 hedges living in the spring of 1896. To these have been added the following 14 species, making a total of 75 hedges now living, all of different species and varieties.

ADDITIONS TO SAMPLE HEDGES.

Southernwood—*Artemisia Abrotanum.*.
Russian Southernwood—*Artemisia Abrotanum tobolskianum.*
Green Alder—*Alnus viridis.*
Common Cotoneaster—*Cotoneaster vulgaris.*
Sharp-leaved Cotoneaster—*Cotoneaster acutifolia.*
Dwarf Caragana—*Caragana pygmæa.*
Siebold's Weigelia—*Diervilla rosea Sieboldii.*
Tartarian Honeysuckle—*Lonicera tatarica.*
Elegant Tartarian Honeysuckle—*Lonicera tatarica elegans.*
Spiræa aubifolia—
Pyramidal Poplar—*Populus nigra pyramidalis.*
Sharp-leaved Willow—*Salix acutifolia.*
Germander-leaved Spiræa—*Spiræa chamædrifolia.*
Heath-like Retinospora—*Cupressus ericoides.*

SOME CHOICE HARDY ORNAMENTAL TREES AND SHRUBS.

In the Director's report for 1894 will be found a list of some of the most desirable hardy flowering shrubs. To that list may be added the following trees and shrubs which are well worthy of more general cultivation.

Katsura Tree—Cercidiphyllum japonicum—This is a very striking, compact, pyramidal shaped tree, with heart-shaped leaves, delicately red veined, which has been thoroughly tested here and found to be quite hardy. It is a native of Japan where it grows to a large size. The katsura tree is closely related to the magnolia family.

Ginnalian Maple—Acer tataricum Ginnala—A very pretty maple which is perfectly hardy and well worthy of more extensive cultivation. It is a small tree, sometimes shrub-like in growth, with deeply cut leaves, which become very attractive when they assume their autumnal colours. It is a native of Amurland and a variety of A. tataricum but is much more beautiful.

Pyrus japonica Maulei—This variety of the Japanese quince is quite hardy at Ottawa. Blooming as it does early in the spring before the leaves are fully developed, its clusters of bright red flowers make it a very noticeable and pleasing object. It is a smaller growing shrub than Pyrus japonica, which is not hardy at Ottawa.

Lonicera Alberti—One of the most ornamental of the more recently introduced honeysuckles. It is a small, low-growing shrub, native of Turkestan, with pendulous branches, linear leaves, bright pink or rose coloured blossoms, and is intermediate in

habit of growth between the bush and climbing types. This charming honeysuckle would be a most desirable acquisition to any garden and is quite hardy.

Ligustrum amurense—The only privet yet tested at the Experimental Farm which has proved perfectly hardy. It is quite as ornamental as the common privet, *Ligustrum vulgare*, and has the advantage of wintering well to the tips every season. It is a native of Japan and China.

Garland Flower—Daphne Cneorum—This charming little evergreen shrub, which is a native of Eastern Europe has proved hardy at Ottawa, and early in May is covered with clusters of bright pink, sweet scented blossoms. It flowers again late in the autumn, though not so freely as in the spring. It is a very low-growing shrub, twelve to eighteen inches in height, and is very suitable for flower borders.

Syringa villosa—A native of northern China, this lilac flowers after all the varieties of the common species S. vulgaris have lost their bloom. The flowers are pale lilac in colour, and not so fragrant as the varieties of the common lilac. It is very desirable, because of its lateness in blooming.

Hypericum Kalmianum—There are few shrubs, hardy at Ottawa, which bloom in July, but during the second and third weeks of that month, this showy species of St. John's wort is covered with its large bright yellow flowers, making a very attractive shrub at a time when bloom is scarce. It is a native of south-western Ontario and the northern United States.

Alcock's spruce—Picea Alcockiana—Of the many valuable hardy ornamental trees and shrubs, introduced from Japan, this is one of the best. It is quite distinct from any other spruce growing at the Experimental Farm. The contrast in colour between the dark green of the upper surface of the leaves and the bluish, silvery green of the lower surface, together with its symmetrical growth, make it a very attractive and desirable species.

Colorado Blue Spruce—Picea pungens—This beautiful spruce is a native of the north-western States, and is perfectly hardy at Ottawa. Its chief beauty lies in the steely blue colour of the leaves, which make it a very conspicuous object wherever planted. Trees of this species vary greatly in colour from blue to dull green, those of the former shade being much more valuable for ornamental purposes than the latter.

Maiden-hair tree—Gingko biloba—This interesting and graceful tree is a deciduous conifer from Japan, where it grows to a large size. Its peculiar fan-shaped leaves make it very attractive and ornamental. It has been growing at the Experimental Farm for nine years, and has proved hardy.

Cupressus pisifera (Retinospora pisifera). This beautiful and graceful evergreen has also been introduced from Japan, and is hardy at Ottawa. It has a pendulous habit of growth, is of a bright green colour, and so attractive in appearance as to make it very valuable for ornamental purposes. Although a tree in Japan, it is still shrub-like in growth here.

Cupressus pisifera plumosa—Though more compact than *Cupressus pisifera* this tree is very ornamental. Its branchlets are somewhat feathery in form, hence its name. The bright green and golden varieties of this type are also very beautiful.

Cupressus pisifera filifera.—A very distinct and striking variety of *Cupressus pisifera*, with pendulous branches and long thread-like leaves, which give it an unusual appearance. As it acquires age this tree becomes very compact and beautiful, and attracts attention wherever planted.

Cupressus ericoides, Heath-like Retinospora.—This pretty dwarf evergreen, generally known as *Retinospora ericoides*, is a very desirable shrub. Its leaves and branches resemble heather in general appearance and are quite soft to the touch; during the summer they are of a delicate green colour, but as winter approaches become of a dull purplish hue. Specimens of this shrub planted six years ago are about two feet in height.

There is a large number of very beautiful and interesting varieties of the American arbor-vitæ, Thuya occidentalis. Of these, some of the finest are T. occ. Hoveyi, T. occ. compacta, T. occ. pyramidalis, T. occ. Ellwangeriana, T. occ. globosa, T. occ. aurea, and T. occ. vervaenana, all of which are quite hardy and very ornamental.

ARBORETUM.

The sixty-five acres of land, reserved at the Central Experimental Farm, as a site for an Arboretum and Botanic Garden, are rapidly being utilized for that purpose, and during the past season much progress has been made both in regard to the addition of new species and varieties of trees, shrubs, and plants, and also in preparing the land for them.

There were 935 species and varieties of trees and shrubs growing in the Arboretum last year; this year the number has increased to 1,931, representing 173 genera; while in the border specially devoted to the growing of perennial plants there are now 907 species and varieties comprising 222 genera.

These collections, though yet by no means complete, have already demonstrated the practicability of growing a larger number of species of trees, shrubs, and plants, in this vicinity than was at first anticipated. They now form also a valuable field for botanical study and an attraction to visitors who find much delight in observing the many new and interesting forms to be found there. The accompanying plate from a photograph taken in June, 1896, gives a view of the trees and shrubs on one part of the grounds and indicates the progress which has been made since the planting was begun in 1889.

DONATIONS.

Several public institutions, as well as private individuals, have kindly assisted in the addition of new species and varieties by sending either collections of seeds or specimens of plants, shrubs or trees.

To the Royal Gardens, Kew, we are indebted for a large collection of seeds of valuable and interesting species; to the Arnold Arboretum, Boston, Mass., for seeds, from time to time, of the more recently introduced trees and shrubs; to the Royal Botanic Gardens, Sapporo, Japan, for seeds of Japanese trees, shrubs and plants: and to the Botanic Gardens, Ventimiglia, Italy, for a collection of seeds of greenhouse plants and hardy perennials. To Mr. William E. Saunders, of London, Ont., we are also indebted for many species of native plants collected by him in Western Ontario. We desire to acknowledge also valuable contributions from Dr. Chas. Shaffer, of Philadelphia, of seeds of hardy plants and specimens of shrubs grown in the Selkirk Mountains.

PROGRESS OF THE WORK.

The first work done in the Arboretum, in the spring of 1896, was the removal of the light coating of manure, given in the autumn, to the perennial border which is 12 feet wide and extends for 2,100 feet along the east side of a thrifty hedge of arbor vitae. The plants in this border stood the winter very well with the slight protection referred to, and from early spring to late in the autumn there was a continuity of bloom. Some of the trees and shrubs also had received a mulch of manure in the autumn; this was likewise removed as soon as possible. Although the winter was very severe, the trees and shrubs did not suffer as much as was anticipated; the weigelias and some other things, always comparatively tender, were, however, winter-killed more than usual.

The pony lawn mower was started on the 14th of May and kept the grass in very satisfactory condition throughout the season. There was very little work done with the hand mower as the large circles about the trees and shrubs enabled the pony mower to cut the grass close to the margin.

With the increase in the number of trees and shrubs growing in the Arboretum, the work of keeping them in order has necessarily been materially augmented. The past season being an exceptionally dry one also, the soil had to be kept frequently stirred in the circles about the trees, in order that the moisture might be conserved as much as possible.

The roads, required considerable attention to keep down weeds and preserve their general outline. The new roads which have been laid out this autumn will increase the work in this line next season.

View in the Arboretum and Botanic garden at the Central Experimental Farm, Ottawa.

An area of about ten acres, not yet seeded down, was kept cultivated with the horse cultivator from spring until autumn to destroy weeds and promote tree growth by conserving moisture and permitting air to penetrate the soil more freely. This autumn another portion of the land which has been used as a pasture for some years was ploughed and will be got into good tilth next season, so that it may be used for the planting of additional trees and shrubs as required.

From the figures given elsewhere it will be seen that the additions made to the number of species in the Arboretum this year, were large. The greater part of the planting was done in the spring, but as the material on hand was not exhausted then, the work was continued in the autumn.

The perennial border required considerable attention this year to destroy weeds and keep the surface soil loose. The horse cultivator did a large part of the work, and the hand hoe, the remainder. In addition to that part of the border planted this year there has been space prepared for a large number of new species.

Notes were made during the season on the growth, hardiness, and time of blooming of most of the trees, shrubs and plants, and the height has been taken of a large number of the trees. These data will, no doubt, be useful for future reference. The specimens planted this year have all been labelled with the zinc label described in the report for 1895. These labels have, thus far, proved satisfactory.

W. T. MACOUN,
Foreman of Forestry.

FORTY-ACRE LOT.

In the spring of 1891 forty acres of land were set apart at the Central Experimental Farm for the purpose of growing fodder crops for cattle, in order to ascertain how many cattle could be fed each year on the crops from that area. The main object in this experiment as set forth in the report of the Agriculturist for 1891 was to direct the attention of farmers to the practicability of keeping cattle in larger numbers than had been their custom on the moderate and small sized farms of Canada.

The soil of that part of the farm selected for this experiment was partly clay and partly sandy loam and included about five acres of light sandy loam and three acres of a peaty loam.

This experiment was begun on 3rd July, 1891, with 25 cows, and closed 6th June, 1892, having been carried on for a period of 11 months and 4 days. On the 7th of June, 1892, the test for the second year was begun with 28 cows and continued for the full year, viz., until 6th June, 1893.

The tests for the third year were begun with 30 cows on 7th June, 1893, but owing to the discovery of tuberculosis in the farm herd that year and the necessary slaughter of some of the animals the experiment was closed on the 29th July.

On 5th July, 1894, the test for the fourth year was resumed with 30 cows and continued for the full year until July 4th, 1894, and begun again on 5th July, 1895, for the fifth period and continued with 30 cows for another full year, until 4th July, 1896. Since four full years experience was deemed sufficient to accomplish the objects for which these experiments were planned they have not been further continued.

Full particulars of the crops obtained from this forty acres of land were given by the Agriculturist in the Annual Reports of the Experimental Farms for 1891, pp. 104, 109, 1892, pp. 78–85 and 1894, pp. 93–101 to which the reader is referred. It will be seen that the number of acres of crops does not exactly correspond with the number of acres worked for the reason that some of the land each year was twice cropped.

In the following statement a brief summary is given of the crops produced each year including those of 1895 and also of 1893, when the experiment was necessarily interrupted. An approximate estimate of the value of these crops is also given, with particulars of the quantities of food which it was found necessary to borrow from the farm or to purchase each year to supplement that produced on the forty acre lot.

During the summer the cows were turned out every evening after milking and remained all night in a small pasture field which formed part of the forty acres, where they were fed in season with green feed cut from some part of the lot. They were driven to the barn in the morning where they remained and were fed during the day.

None of the straw used for bedding these animals was supplied from the forty acre plot, that was all drawn from the farm stock, and no barn-yard manure or other fertilizer was applied to this land during the whole period of the experiment other than that produced by the cattle placed under this test.

FIRST YEAR, 1891–92.

Twenty-five cows were put on this test on 3rd July, 1891, and continued until 6th June, 1892, (11 months 4 days).

Crops from the forty acres, season of 1891.

Variety.		Yield in Tons.	Yield in Lbs.	Estimated Value per Ton.	Total Value.
				$ cts.	$ cts.
14 acres mixed grain crop	Straw	21	1,791	4 00	87 58
	Grain	11	365	20 00	223 65
3 acres roots		37	131	4 00	148 26
½ acre cabbage		7	1,296	2 00	15 30
2 acres spring rye put into silo		7	1,905	2 00	15 91
11½ acres corn, cut for ensilage		130	1,750	2 00	261 75
1 acre corn, cured in stooks		5	1,940	4 00	23 88
				Per acre.	
1½ acres corn, cut and fed green				21 00	31 50
3⅔ acres mixed grain, fed green				17 50	64 17
Total					872 00

The following quantities of food were borrowed from the farm to supplement the products from the forty acres, during the feeding period the first year, 11 months and 4 days :—

Variety.	Tons.	Pounds.	Estimated Value per Ton.	Total Value.
			$ cts.	$ cts.
Roots	36	377	4 00	144 75
Hay	14	637	8 00	114 54
Corn fodder	4	1,840	4 00	19 68
Straw for feed	3	1,077	4 00	14 15
Oats, ground	1	1,900	20 00	39 00
Barley do	1	1,730	20 00	37 30
Pease do		600	20 00	6 00
Bran		640	12 00	3 84
Oil cake, ground		1,100	22 00	12 10
Cotton seed meal		1,000	25 00	12 50
				403 86
Deduct from this the value of food left on hand— Corn ensilage	13	1,930	2 00	27 93
				375 92

During this first year the food required to supplement that produced on the forty acre lot was equal in value to about 43 per cent of the whole, hence the food from the forty acres was more than equal to the feeding of 14 cows for one year. The land during the first season was not in good shape, and better results were obtained afterwards.

SECOND YEAR, 1892-93.

Twenty-eight cows were put on this test on 7th June, 1892, and continued for the full year, until 6th June, 1893.

CROPS from the forty acres, season of 1892.

Variety.		Yield in		Estimated value per ton.	Total value.
		Tons.	Lbs.	$ cts.	$ cts.
$8\frac{75}{100}$ acres mixed grain crop	Straw	12	1,039	4 00	50 07
	Grain	6	1,317	20 00	133 17
5 acres mixed grain crop, cured		16	605	4 00	65 21
$6\frac{90}{100}$ acres mixed grain crop and rye, fed green		34	906	2 00	68 90
5 acres roots		64	448	4 00	256 89
$16\frac{73}{100}$ acres corn with horse beans and sunflowers, cut for ensilage		245	1,467	2 50	614 33
$2\frac{43}{100}$ acres pasture					
					1,188 57

The following quantities of food were borrowed from the farm to supplement the products from the forty acres during this second year :—

Variety.	Tons.	Pounds.	Estimated value per ton.	Total value.
			$ cts.	$ cts.
Roots	31	941	4 00	125 88
Straw, for feed	5	262	4 00	20 52
Mixed grain, ground	2	1,261	20 00	52 61
Wheat, ground		1,760	20 00	17 60
Oats do		660	20 00	6 60
Barley do		1,485	20 00	14 85
Pease do		205	20 00	2 05
Bran do		1,165	12 00	6 99
Oil cake do		935	22 00	10 28
				257 38
Deduct from this the value of food left on hand, 28 tons corn ensilage at $2 per ton				56 00
				201 38

During the second year the food required to supplement that produced on the forty acre lot was equal in value to nearly 17 per cent of the whole, hence the food grown on the forty acres was more than equal to the feeding of 23 cows for the full period of one year.

THIRD YEAR 1893–94.

Thirty cows were put on this test on 7th June, 1893, and continued until 29th July, 1893, (1 mo. 22 ds.). This break in the continuity of the experiment was, as already stated, caused by the discovery of tuberculosis in the herd and the necessary slaughter of some of the animals.

Crops from the forty acres, season of 1893:

Variety.	Yield in		Estimated Value per ton.	Total Value.
	Tons.	Lbs.	$ cts.	$ cts.
$8\frac{91}{100}$ acres mixed grain crop { Straw	15	863	4 00	61 72
{ Grain	4	1973	20 00	99 73
$6\frac{66}{100}$ " " and rye cut and cured as hay	19	155	8 00	152 62
4 acres roots	88	450	4 00	352 90
22 " corn with horse beans and sunflower heads made into ensilage	217	464	2 50	543 08
$2\frac{43}{100}$ acres pastures.				
Total	....		....	1,210 05

FOURTH YEAR 1894-95.

Thirty cows were put on this test on the 5th of July, 1894, and continued for the full year until 4th July, 1895.

Crops for the forty acres, season of 1894:

Variety.	Yield in		Estimated Value per ton.	Total Value.
	Tons.	Lbs.	$ cts.	$ cts.
$7\frac{75}{100}$ acres mixed grain crop cured	18	200	4 00	72 40
1 " " cut green	7	1390	1 75	13 46
4 " roots	100	907	4 00	401 82
$28\frac{13}{100}$ " corn, beans and sunflower heads made into ensilage	289	850	2 50	723 56
$4\frac{37}{100}$ " pasture.				
Total	....		....	1,211 24

The following quantities of food were borrowed from the farm to supplement the products from the forty acres during this fourth year:—

Variety.	Yield in		Estimated value per ton.	Total value.
	Tons.	Lbs.	$ cts.	$ cts.
Ensilage	18	737	2 00	36 73
Hay	8	1,607	8 00	70 42
Oil cake	3	701	22 00	73 71
Bran	4	46	12 00	48 27
				229 13
Deduct from this the value of the food left on hand—4 tons 1,825 lbs. roots at $4 per ton				19 65
				209 48

During the fourth year the food required to supplement that produced on the forty acre lot was equal in value to nearly 17 per cent of the whole; hence the food grown on the forty acres was nearly equal to the feeding of 25 cows for the full period of one year.

FIFTH YEAR, 1895-96.

Thirty cows were put on this test on 5th July, 1895, and continued for the full year until 4th July, 1896.

CROPS from the forty acres, season of 1895.

Variety.	Yield in		Estimated value per ton.	Total value.
	Tons.	Lbs.	$ cts.	$ cts
$2\frac{75}{100}$ acres sunflower heads	16	791	6 30	103 29
2 do carrots	46	1,160	4 60	186 32
2 do mangels	47	1,750	4 00	191 50
$12\frac{75}{100}$ do corn cut for ensilage	165	1,028	2 00	331 02
5 do corn and horse beans cut for ensilage	74	1,769	2 50	187 21
$4\frac{25}{100}$ do horse beans cut for ensilage	30	815	2 70	82 10
10 do mixed grain crop cured	26	1,675	4 00	107 35
4 do do do 2nd crop cut green	6	710	1 75	11 13
1 do corn fodder	7	1,345	4 00	30 69
				1,230 61

The following quantities of food were borrowed from the farm to supplement the products from the forty acres during this fifth year :—

Variety.	Yield in		Estimated value per ton.		Total value.
	Tons.	Lbs.	$ cts.		$ cts.
Hay*	19	764	8 00		155 05
Bran	3	1,763	12 00		46 57
Oil cake	3	87	22 00		66 95
Barley ground	1	764	20 00		27 64
Wheat do	....	880	20 00		8 80
Pease do	......	270	20 00		2 70
					307 71
Deduct from this the value of the food left on hand—					
Corn ensilage, 29 tons 1,780 lbs. at $2 per ton				$ 59 78	
Corn fodder, 613 lbs. at $4 per ton				1 22	
					61 00
					246 71

* Ten of the cows were put on a special ration of hay and roots for one month, which accounts for the large quantity of hay borrowed this year.

During the fifth year the food required to supplement that produced on the forty acre lot was equal in value to 20 per cent of the whole; hence the food grown on the forty acres was equal to the feeding of 24 cows for the full period of one year.

SUMMARY.

The results obtained show that sufficient food has been grown on the forty acre lot during the course of these experiments to sustain the following number of cows—the straw used for bedding being taken from the farm stock :—

For the first year, 1891-92	14 cows
For the second year, 1892-93	23 "
For the third year, 1893-94, broken period	
For the fourth year, 1894-95	25 "
For the fifth year, 1895-96	24 "

THE FEEDING OF STEERS, 1895-96.

The object in view in these experiments was to gain information on the relative cost of fattening steers on different rations, the bulky-fodder portions of which was as follows: First ensilage combination, a mixture of corn, horse beans and sunflowers, composed of 10 tons of the corn, 2½ tons of the horse beans and 1 ton of the sunflower heads, all cut up and mixed together in the silo, with half its weight of turnips and one-tenth its weight of hay. Second, with a bulky-fodder ration, consisting of an equal weight of corn fodder and turnips, with one-fifth the weight of hay, and, third, a ration of which the bulky-fodder portion consisted of hay and turnips. The animals were allowed as much of these mixtures as they would eat. Meal also was fed in addition in varying proportions. The meal used for all the groups was composed of equal parts by weight of barley, wheat, pease, bran and ground oil cake, and in estimating the cost of the rations, this mixture has been valued at the uniform rate of one cent per lb. After the usual preliminary feeding, when all were fed alike for about six weeks, the tests were begun and the experiments continued for twenty weeks.

With the object of making the results of these experiments clear a price was put on each of the components of the bulky-fodder portions of the ration. Combination ensilage (corn, horse beans, and sunflower heads) has been valued at $2.50 per ton, turnips at $2 per ton, hay at $8 per ton, and corn fodder at $4 per ton. These prices may be considered high or low in different localities, but they are believed to be about the cost of production at Ottawa and will afford a basis for comparison in all parts of the Dominion.

To group No. 1 no meal was given for the first six weeks; for the next eight weeks 2 lbs. was given to each animal per day, and for the remaining six weeks 4 lbs. of meal to each per day.

To groups No. 2 and 3 there were given for the first six weeks 4 lbs. of meal to each animal per day, and six lbs. of meal to each per day for the remaining fourteen weeks.

During the course of these tests the steers had access to water in a trough in front of their stalls, they were also supplied with salt in a small box at the side of the manger. They were weighed once every week and the feed they consumed was weighed every day.

Twelve steers were purchased on 1st November, 1895, which weighed as follows:

	Lbs.		Lbs.		Lbs.
No. 1......	1,020	No. 5......	1,080	No. 9......	975
2......	1,030	6......	1,100	10......	1,005
3......	1,080	7......	1,070	11......	1,145
4......	1,125	8......	1,000	12......	1,135

These animals were fed from 1st November to 17th December, 1895, on the following ration.

	Lbs.
Corn ensilage......	50
Roots......	25
Hay......	5

No meal was given and the food consumed was not weighed.

On 17th December, the steers were grouped as below, and the average of three weighings was as follows:

Group No. 1.	Lbs.	Group No. 2.	Lbs.	Group No. 3.	Lbs.
No. 1......	1,030	No. 5......	1,160	No. 9......	990
2......	1,088	6......	1,125	10......	1,065
3......	1,130	7......	1,160	11......	1,210
4......	1,140	8......	1,015	12......	1,130

These figures show that the total gain during this period was: in group No. 1, 133 lbs.; No. 2, 210 lbs.; and in No. 3, 135 lbs.; and that the three groups weighed collectively at the beginning of the test 4,255 lbs., 4,250 lbs. and 4,260, the heaviest group

exceeding the lightest by only 10 lbs. On 17th December the feeding test was begun and the rations were as follows :—

GROUP 1 ON RATION 1.

Ensilage combination....	50 lbs. at $2.50 per ton.......	$6\frac{1}{4}$ cents.
Turnips...............	25 " 2.00 "	$2\frac{1}{2}$ "
Hay.................	5 " 8.00 "	2 "
	80 lbs. cost..................	$10\frac{3}{4}$ "

Results for the first six weeks during which time no meal was given :—

Steer.	Fodder consumed per day.	Meal per day.	Total Increase in Weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 1	51·88	...	60	1·42	6·97	4 87
No. 2	60·19	...	57	1·35	8·08	5 95
No. 3	60·19	...	45	1·07	8·08	7 54
No. 4	57·54	...	30	·71	7·73	10 82
Average	57·45	...	48	1·13	7·71	6 74

Results for the next eight weeks, during which time each animal received 2 lbs. of meal per day :—

Steer.	Fodder consumed per day.	Meal per day.	Total Increase in Weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 1	51·30	2	70	1·25	8·89	7 11
No. 2	56·53	2	75	1·33	9·59	7 16
No. 3	57·33	2	70	1·25	9·70	7 76
No. 4	56 66	2	80	1·42	9·61	6 72
Average	55·45	2	$73\frac{3}{4}$	1·31	9·44	7 16

Results for the remaining six weeks during which time each animal received 4 lbs. of meal per day :—

Steer.	Fodder consumed per day.	Meal per day.	Total Increase in Weight.	Increase in Weight per day.	Cost per day.	Cost per 100 lbs.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 1	51·71	4	84	2·00	10·94	5 47
No. 2	56·50	4	99	2·35	11·59	4 91
No. 3	57·40	4	98	2·33	11·71	5 01
No. 4	56·26	4	63	1·50	11·55	7 70
Average	55 46	4	86	2·04	11·44	5 58

GROUP 2 ON RATION 2.

Corn fodder..........	25 lbs. at $4 per ton............	5 cents.
Turnips..............	25 " 2 "	2½ "
Hay..................	5 " 8 "	2 "
	55 lbs. cost....................	9½ "

Results for the first six weeks, during which time each animal received 4 lbs. of meal per day :—

Steer.	Fodder Consumed per day.	Meal per day.	Total Increase in Weight.	Increase in Weight per day.	Cost of Food per day.	Cost per 100 lbs.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 5....................	49·90	4	70	1·66	12·61	7 56
No. 6....	42·28	4	35	·83	11·30	13 56
No. 7.........	49·90	4	55	1·30	12·61	9 62
No. 8...	40·76	4	50	1·19	11·04	9 27
Average...........	45·71	4	52½	1·24	11·89	9 51

Results for the next eight weeks, during which time each animal received 6 lbs. of meal each per day.

Steer.	Fodder Consumed per day.	Meal per day.	Total Increase in Weight.	Increase in Weight per day.	Cost of Food per day.	Cost per 100 lbs.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 5....................	39·98	6	85	1·51	12·90	8 49
No. 6...................	36·05	6	75	1·33	12·22	9 12
No. 7.................. ..	40·82	6	85	1·51	13·05	8 59
No. 8...................	28.83	6	20	·35	10·97	30 71
Average............	36·42	6	66¼	1·17	12·28	10 38

Results for the remaining six weeks, during which time each animal continued to receive six pounds of meal per day.

Steer.	Fodder Consumed per day.	Meal per day.	Total Increase in Weight.	Increase in Weight per day.	Cost of Food per day.	Cost per 100 lbs.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 5.............. .	39·23	6	64	1·52	12·77	8 37
No. 6....................	38·57	6	48	1·14	12·66	11 07
No. 7	40·97	6	70	1·66	13·07	7 84
No. 8.........	28·90	6	28	·66	10·95	16 42
Average...........	36·91	6	52½	1·24	12·36	9 88

GROUP 3 ON RATION 3.

Hay..................	20 lbs. at $8 per ton...........	8 cents.
Turnips	50 " 2 "	5 "
	70 lbs. cost...................	13 "

Results for the first six weeks during which time each animal received 4 lbs. of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total Increase in weight.	Increase in weight per day.	Cost of food per day.	Cost per 100 lbs. of gain.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 9..................	42·54	4	65	1·54	11·90	7 68
" 10.	47·90	4	50	1·19	12·89	10 82
" 11.	49·	4	35	·83	13·10	15 72
" 12..................	51·78	4	70	1·66	13·61	8 16
Average..........	47·80	4	55	1·30	12·87	9 82

Results for the next eight weeks during which time each animal received 6 lbs. of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost of food per day.	Cost per 100 lbs. of gain.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 9..................	40·66	6	70	1·25	13·55	10 84
" 10*................						
" 11..................	40·14	6	70	1·25	13·45	10 76
" 12.	50·28	6	105	1·87	15·33	8 17
Average......	43·69	6	81·66	1·45	14·11	9 67

*Sick, supposed to be from something swallowed in feed.

Results for the remaining six weeks during which time each animal continued to receive 6 lbs. of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost of food per day.	Cost per 100 lbs. of gain.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 9.	38·38	6	50	1·19	13·12	11 02
" 10................	40·47	6	85	2·02	13·51	6 67
" 11........	39·33	6	39	·92	13·30	14 32
" 12..................	45·64	6	54	1·28	14·47	11 25
Average.	40·95	6	57	1·35	13·60	10 02

From these tests it appears that the four steers fed on ration 1 gained in all during the feeding period 831 lbs. at a cost of $6.49 per 100 lbs. The four steers fed on ration 2 gained in all during the feeding period 685 lbs. at a cost of $9.92 per 100 lbs., while the four steers fed on ration 3, made a total gain of 693 lbs. at a cost of $9.83 per 100 lbs.

Taking the cost per day, each animal in group 1 was fed at a cost of 9·53 cents per day ; group 2, ta a cost of 12·18 cents, and group 3, at a cost of 13·53 cents each per day.

During the feeding period of twenty weeks, the steers fed on ration 1 gained, on the average, 36½ lbs. per head more and cost 2·65 cents less per head per day for the feed consumed than the steers which were fed on ration 2 ; and they gained 34½ lbs. per head more and cost 4 cents per head less per day than the steers which were fed on ration 3. This appears to show that of the three rations used in these experiments, No. 1 was the most profitable.

EXPERIMENTS IN THE FATTENING OF SWINE.

The experiments begun in 1890 have been continued each year since, in the feeding of swine on different rations with the object of gaining information useful to the farmers of Canada as to the most economical and profitable methods of producing pork of the best quality. Particulars are given of the different sorts of feed used, and the quantities consumed, also the increase in the live weight of the animals under test.

Lot 1.—(Pen 2.) This pen contained five cross-bred swine, Essex sire and Berkshire dam, farrowed 12th June, 1895, and were fed all they would eat up clean, of a ration composed of equal parts by measure of ground barley, rye, wheat and bran, soaked in cold water for thirty hours. There was also given to each pen 30 lbs. of skim milk per day. This feeding test was begun on 18th September, 1895, and continued for twelve weeks ; the pigs were weighed at the end of each two weeks and the increase in weight, food consumed, &c., are given in the accompanying table for each four weeks :—

No. of Swine, Five.	Sept. 18.	Oct. 16.	Nov. 13.	Dec. 11.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	299	481	683	877	....
Increase in weight	....	182	202	194	578
Feed consumed, meal	....	424	635	737	1,796
do do milk	....	840	840	840	2,520
					Average.
do per lb. of increase, meal	....	2·32	3·14	3·79	3·10
do do milk	....	4·61	4·15	4·32	4·35

Sold 23rd December—Shrinkage in weight :—

Live weight (fasted 14 hours)	932 lbs.
Dressed weight 24 hours after killing	725 "
Percentage of shrinkage from fasted weight	22·21

Lot 2.—(Pen 3). This pen contained five cross-bred swine, Essex sire and Berkshire dam; farrowed 12th June, 1895, and were fed on the same meal ration as Lot 1, but only half the quantity. Thirty pounds of skim milk were given to each pen per day, and all the sunflower heads the pigs would consume. These also were fed for twelve weeks.

No. of Swine, Five.	Sept. 18.	Oct. 16.	Nov. 13.	Dec. 11.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	305	428	600	771	....
Increase in weight	....	123	172	171	466
Feed consumed, meal	....	212	317½	368½	898
" milk	....	840	840	840	2,520
" sunflower heads	....	274	351	361	986
" per lb. of increase, meal	....	1·72	1·84	2·15	aver. 1·92
" milk	....	6·82	4·88	4·91	5·40
" sunflower heads	....	2·22	2·04	2·11	2·11

Sold 23rd December. Shrinkage in weight:—

Live weight (fasted 14 hours) .... 828 lbs.
Dressed weight 24 hours after killing .... 616 "
Percentage of shrinkage from fasted weight .... 25·60

Lot 3.—(Pen 4). This pen contained three cross-bred swine, one Berkshire sire and Yorkshire dam, farrowed 29th September; one Berkshire sire and Tamworth dam, farrowed 29th September, and one Tamworth sire and Berkshire dam, farrowed 30th September, 1895. These were fed for the first five weeks on raw potatoes pulped, all they would eat with 9 lbs. of skim milk per day to the pen, but finding they made no progress the ration was changed, and for the remainder of the feeding period of twenty weeks they were fed on meal only, composed of equal parts by measure of ground barley, rye, wheat and bran soaked in cold water for 30 hours. The test with this mixed meal was begun on 18th December, 1895, and continued for twenty weeks.

No. of Swine, Three.	Dec. 18, 1895.	Jan. 22, 1896.	Feb. 26.	Apr. 1.	May 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	167	169	271	382	458	....
Increase in weight	....	2	102	111	76	291
Feed consumed, potatoes	....	400	....	....	....	400
" meal	....	....	367	365	353	1,085
" milk	....	315	....	....	....	315
Feed per lb. of increase, potatoes	....	200	....	....	....	aver. 1·37
" " meal	....	....	3·59	3·28	4·64	3·72
" " milk	....	157½	....	....	....	1·08

Sold May 12. Shrinkage in weight:—

Live weight (fasted 14 hours) .... 491 lbs.
Dressed weight (24 hours after killing) .... 376 "
Percentage of skrinkage from fasted weight .... 23·42

Lot 4.—(Pen 5.) This pen contained three cross-bred swine, one Berkshire sire and Yorkshire dam, farrowed 24th September; one Berkshire sire and Tamworth dam, farrowed 29th September; and one Tamworth sire and Berkshire dam, farrowed 30th September. These were fed from the 18th of December to the 1st of April on cooked potatoes, all they would eat, with 9 lbs. of skim milk per day to the pen. Finding that the pigs were not making satisfactory progress the ration was changed on 1st April, and

for the remaining five weeks they were fed on meal only, composed of equal parts by measure of ground barley, rye, wheat and bran, soaked in cold water for 30 hours. The feeding period in this instance also was twenty weeks, the results being given in the appended table in four equal periods of five weeks each, The potatoes fed were weighed before boiling.

No. of Swine, Three.	Dec. 18, 1895.	Jan. 22, 1896.	Feb. 26.	April 1.	May 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	167	213	292	361	514	
Increase in weight	....	46	79	69	153	347
Feed consumed, potatoes	....	695	870	928	......	2,493
do do meal	....	....	....	....	530	530
do do milk	....	315	315	315	....	945
						Average.
do per lb. of increase, potatoes	....	15·10	11·01	13·44	....	7·18
do do meal	....	....	....	....	3·46	1·52
do do milk	....	6·84	3·98	4·56	....	2·72

The shrinkage in the dressing of this lot was not ascertained.

Lot 5 (Pen 6).—This pen contained three cross-bred swine—one Berkshire sire and Yorkshire dam, farrowed 24th September, 1895; and two Tamworth sire and Berkshire dam, farrowed 30th September, 1895. These were fed for the first five weeks (18th Dec. to 22nd Jan.) on raw potatoes, pulped with 3 lbs. of meal per day to the pen. As the pigs were not making satisfactory progress the ration was changed for the next five weeks (22nd Jan. to 26th Feb.) to boiled potatoes only; and after the 26th of February, for the remaining ten weeks of the feeding period, to a ration of meal composed of equal parts, by measure, of ground barley, rye, wheat and bran, soaked in cold water for 30 hours, with 9 lbs. of skim milk per day to the pen. In this instance also the feeding was begun on the 18th of December and continued for 20 weeks.

No. of Swine, Three.	Dec. 18, 1895.	Jan. 22, 1896.	Feb. 26.	April 1.	May 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	165	188	216	396	577	
Increase in weight	....	23	28	180	181	412
Feed consumed, potatoes, raw	....	293	....	....	....	293
do do do cooked	....	....	995	....	....	995
do do meal	....	105	....	365	473	943
do do milk	....	....	....	315	315	630
						Average.
do per lb. of increase, potatoes, raw	....	12·73	....	....	....	·71
do do do cooked	....	....	35·53	....	....	2·41
do do meal	....	4·56	....	2·02	2·61	2·28
do do milk	....	....	....	1·75	1·74	1·52

Sold May 12. Shrinkage in weight:—

Live weight (fasted 14 hours) .... 591 lbs.
Dressed weight 24 hours after killing .... 455 "
Percentage of shrinkage from fasted weight........ 23·01

Lot 6 (Pen 7).—This pen contained three cross-bred swine, one Berkshire sire and Yorkshire dam, farrowed 24th September, 1895; one Berkshire sire and Tamworth dam, farrowed 29th September; and one Tamworth sire and Berkshire dam, farrowed 30th September. These were fed for the first 15 weeks on a ration of cooked potatoes, all they would eat, with 3 lbs. of meal per day to the pen. After this the ration was changed for the remaining five weeks to meal only, composed of equal parts, by measure, of ground barley, rye, wheat and bran, soaked in cold water for 30 hours, with 9 lbs. of skim milk per day to the pen.

No. of Swine, Three.	Dec. 18, 1895.	Jan. 22, 1896.	Feb. 26.	April 1.	May 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	164	215	293	386	586	
Increase in weight	....	51	78	93	200	422
Feed consumed, potatoes, cooked	....	560	715	862	....	2,137
do do meal	....	105	105	105	553	868
do do milk	....	....	....	....	315	315
						Average.
do per lb. of increase, potatoes	....	10·98	9·16	9·26	....	5 06
do do meal	....	2·05	1·34	1·12	2·76	2·05
do do milk	....	....	....	....	1·57	·74

The shrinkage in the dressing of this lot was not ascertained.

Lot 7 (Pen 8).—This pen contained three cross-bred swine, one Berkshire sire and Yorkshire dam, farrowed 24th September, 1895, one Berkshire sire and Tamworth dam, farrowed 29th September, and one Tamworth sire and Berkshire dam farrowed 30th September. These were fed for the whole period of twenty weeks on a ration consisting of cooked potatoes, all they would eat, with 3 lbs. of meal per day to the pen, composed of equal parts by measure of ground barley, rye, wheat and bran soaked for 30 hours in cold water, and 9 lbs. of skim milk per day to the pen.

No. of Swine, Three.	Dec. 18, 1895.	Jan 22, 1896.	Feb. 26.	April 1.	May 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	150	240	345	467	575	
Increase in weight	....	90	105	122	108	425
Feed consumed, potatoes, cooked	....	535	620	843	1,103	3,101
do do meal	....	105	105	105	105	420
do do milk	....	315	315	315	315	1,260
						Average.
do per lb. of increase, potatoes	....	5·94	5·90	6·90	10·21	7·29
do do meal	....	1·16	1·	·86	·97	·98
do do milk	....	3·50	3·	2·58	2·91	2·96

Sold May 12, 1896. Shrinkage in weight :—

Live weight (fasted 14 hours)........................ 583 lbs.
Dressed weight, 24 hours after killing............... 457 "
Percentage of shrinkage from fasted weight............ 21·61

Lot 8 (Pen 10).—This pen contained four cross-bred swine, two Berkshire sire and Yorkshire dam, farrowed 6th May, 1896, and two Tamworth sire and Berkshire dam, farrowed 14th April, 1896. These were fed for a period of 18 weeks on a ration of ground oats soaked in cold water for 30 hours, all they would eat, with 24 lbs. of skim-milk per day to the pen. This test, as well as the two which follow, was begun on 22nd July and completed on 25th November, 1896.

No. of Swine, Four.	July 22.	Aug. 19.	Sept. 16.	Oct. 14.	Nov. 11.	Nov. 25	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	218	312	426	539	670	738	
Increase in weight	....	94	114	113	131	68	520
Feed consumed, oats	....	180	299	459	516	244	1,698
do do milk	....	672	672	672	672	336	3,024
							Average.
do per lb. of increase, oats	....	1·91	2·62	4·06	3·93	3·58	3·26
do do milk	....	7·14	5·89	5·94	5·12	4·94	5·81

Sold November 27, 1896. Shrinkage in weight:—

Live weight (fasted 14 hours) .... 724 lbs.
Dressed weight 24 hours after killing .... 542 "
Percentage of shrinkage from fasted weight........... 25·13

Lot 9 (Pen 11).—This pen contained four cross-bred swine, one Berkshire sire and Yorkshire dam, farrowed 7th May, 1896; and three Tamworth sire and Berkshire dam, farrowed 14th April, 1896. These were fed for a period of 18 weeks on a ration of ground pease, soaked in cold water for 30 hours—all they would eat—with 24 lbs. of skim milk per day to the pen.

No. of Swine, Four.	July 22.	Aug. 19.	Sept. 16.	Oct. 14.	Nov. 11.	Nov. 25.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	250	395	546	674	835	896	
Increase in weight	....	145	151	128	161	61	646
Feed consumed, pease	....	272	382	472	452	205	1,783
do do milk	....	672	672	672	672	336	3,024
							Average.
do per lb. of increase, pease	....	1·87	2·52	3·68	2·80	3·36	2·76
do do milk	....	4·63	4·45	5·25	4·17	5·50	4·68

Sold November 27, 1896. Shrinkage in weight:—

Live weight (fasted 14 hours) .... 869 lbs.
Dressed weight 24 hours after killing .... 661 "
Percentage of shrinkage from fasted weight .... 23·93

Lot 10 (Pen 12).—This pen contained three cross-bred swine, one Berkshire sire and Yorkshire dam, farrowed 7th May, 1896; and two Tamworth sire and Berkshire dam, farrowed 14th April, 1896. These were fed for a period of 18 weeks on a ration composed of equal parts by weight, of oats and pease, both ground and soaked in cold water for 30 hours. Of the grain the pigs had all they would eat up clean, with 18 lbs. of skim milk per day to the pen.

No. of Swine, Three.	July 22.	Aug. 19.	Sept. 16.	Oct. 14.	Nov. 11.	Nov. 25.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	182	266	393	497	623	684	
Increase in weight	....	84	127	104	126	61	502
Feed consumed, grain	....	167	295	437	430	179	1,508
do do milk	....	504	504	504	504	252	2,268
							Average.
do per lb. of increase, grain	....	1·98	2·32	4·20	3·41	2·93	3·
do do milk	....	6·	3·96	4·84	4·	4·13	4·51

Sold November 27, 1896. Shrinkage in weight:—
Live weight (fasted 14 hours)........ 672 lbs.
Dressed weight 24 hours after killing........ 505 "
Percentage of shrinkage from fasted weight........ 24·85

RESULTS OF CURATIVE EXPERIMENTS ON CATTLE AFFECTED WITH TUBERCULOSIS.

At the time when the cattle at the Central Experimental Farm were being tested to ascertain the extent of tuberculosis in the herd, in the latter part of 1893 and beginning of 1894, all the older animals which showed a rise in temperature of two degrees or more above the normal were slaughtered. There were, however, five young heifers, from 16 months to three years of age, which although they had all shown high temperatures under the test of tuberculin, it was thought best to isolate and experiment on, by putting them under curative treatment. The names of the animals and the temperatures shown at this time under the action of tuberculin, as reported on page 30, bulletin No. 20, were as follows:—

TEMPERATURES taken 9th January, 1894.

Name of Animal, with Age and Breed.	Quantity of Lymph Injected.	Temperature.						
		Normal.	After Injection.					
	12 p.m.	10 a.m.	3 p.m.	7 p.m.	10 p.m.	1 a.m.	4 a.m.	8 a.m.
Violette (Canadian) 2 yrs, 3 m.	45 minims	102·	101·4	101·4	101·8	103·2	104·2	104·2
Miss Eden (Devon) 2 yrs. 4 m.	55 do	101·6	102·4	103·4	105·8	107·8	105·4	103·2
Aaggie Cornelia 3rd, (Holstein) 1 yr. 9 mos.	55 do	102·	101·8	101·6	103·2	106·	105·8	102·
Princess (Shorthorn grade) 3 yrs. 4 mos.	60 do	101·6	101·8	103·	105·6	107·4	105·4	104.4
Belle of Glen Duart (Jersey) 1 yr. 4 mos.	45 do	101·6	101·8	102·2	105·2	105·4	105·4	104·2

These animals were strictly isolated from the rest of the herd and treatment was begun with them on January 9th, 1894, and continued until December 24th of the same year, giving to each two teaspoonfuls of sulphurous acid per day, in their drinking water. On December 24th, 1894, a second test was made with the following results :—

Name of Animal.	Quantity of Lymph Injected.	Temperature. Normal.	After Injection.				
	3 p.m.	9 a.m.	6 p.m.	9 p.m.	12 p.m.	3 a.m.	6 a.m.
December 24, 1894—							
Violette	25 minims	101·	101·1	101·	103·1	104·2	103·1
Miss Eden	30 do	101·	100·3	100·2	101·3	104·	107·2
Aaggie Cornelia 3rd	30 do	101·4	101·4	101·2	101·4	104·1	104·2
Princess	35 do	101·3	101·1	101·4	103·2	104·3	105·1
Belle of Glen Duart	25 do	101·4	102·	101·3	102·1	105·2	106·2

Since these figures showed no evidence of any benefit from the use of the sulphurous acid, it was discontinued, and as it was the opinion of some physicians that injections of small quantities of tuberculin had a curative action, this was next tried. Beginning on July 1st, 1896, five minims were injected into each animal once a week for four weeks. During a second period of four weeks the quantity was increased to ten minims per animal. During a third similar period, to fifteen minims, and during the last period of four weeks, to twenty minims at each injection. The records of temperature, taken at regular intervals after each injection, show that no very suspicious rise in temperature occurred after any of these injections. The only instances where there were increases of more than one degree above normal were :—

Aaggie Cornelia,	July 1,	after injection of	5	minims, rise above normal	1·2
Princess	Aug. 27	"	10	" "	1·2
"	Oct. 8	"	20	" "	1·1
Miss Eden	" 8	"	20	" "	1·2

In the case of Miss Eden, it will be seen that her normal temperature varied considerably, on August 27th, it was 103. The increase in temperature in the other cases was scarcely sufficient to warrant any very positive opinion as to this being due to the tuberculin.

Name of Animal and Date of Injection.	Quantity of Lymph Injected.	Temperature. Normal.	After Injection.			
		8 p.m.	6 a.m.	9 a.m.	12 a.m.	3 p.m.
July 1st, 1895—						
Violette	5 minims.	102·	102·	101·3	101·4	102·1
Miss Eden	5 "	101·2	100·2	101·	100·4	101·3
Aaggie Cornelia 3rd	5 "	102·	101·3	101·4	101·3	103·3
Princess	5 "	101·4	102·	102·	101·2	101·4
Belle of Glen Duart	5 "	101·2	101·3	101·4	101·4	102·1
July 9th, 1895—						
Violette	5 "	101·2	101·	101·	101·	101·
Miss Eden	5 "	102·	102.1	....	103·	102·1
Aaggie Cornelia 3rd	5 "	101·3	102·1	....	102·2	102·
Princess	5 "	101·4	102·	....	102·2	102·
Belle of Glen Duart	5 "	101·4	101·4	....	101·4	102·

TUBERCULIN TEST—*Continued.*

Name of Animal and Date of Injection.	Quantity of Lymph Injected.	Temperature.				
		Normal.	After Injection.			
		8 p.m.	6 a.m.	9 a.m.	12 a.m.	3 p.m.
July 16th, 1895—						
Violette	5 minims.	101·3	101·1	101·1	101·2	101·2
Miss Eden	5 "	102·1	101·3	102·	101·2	102·
Aaggie Cornelia 3rd	5 "	102·1	101·3	101·4	102·	102·
Princess	5 "	102·1	101·3	101·2	101·2	101·4
Belle of Glen Duart	5 "	101·4	102·	101·4	102·	102·0
July 23rd, 1895—						
Violette	5 "	102·	101·1	101·3	101·3	102·
Miss Eden	5 "	101·1	101·2	101·3	101·4	101·4
Aaggie Cornelia 3rd	5 "	101·2	101·1	101·3	101·3	101·3
Princess	5 "	101·4	101·4	101·2	102·2	102·3
Belle of Glen Duart	5 "	101·3	101·4	101·3	101·4	101·4
July 30th, 1895—						
Violette	10 "	101·3	101·	101·2	101·1	101·2
Miss Eden	10 "	101·1	101 3	101 1	101·2	101·
Aaggie Cornelia 3rd	10 "	101·4	101·3	101·3	101·3	101·2
Princess	10 "	101·2	101·4	101·3	101·3	101·
Belle of Glen Duart	10 "	101·	100·3	101·1	101 1	101·
August 6th, 1895—						
Violette	10 "	101·3	101·4	101·1	101·1	101·3
Miss Eden	10 "	102·1	102·	101·2	101·4	101·4
Aaggie Cornelia 3rd	10 "	101·3	101·2	101·1	101·2	101·1
Princess	10 "	101·2	101·	101·3	101·2	101·1
Belle of Glen Duart	10 "	101·2	101·2	101·3	102·	102·
August 13th, 1895—						
Violette	10 "	101·2	101·	101·1	101·1	101·2
Miss Eden	10 "	101·2	101·2	101·1	101·3	101·3
Aaggie Cornelia 3rd	10 "	101·4	101·1	100·4	101·1	101·
Princess	10 "	101·4	101·1	101·2	101·3	101·3
Belle of Glen Duart	10 "	101·1	101·1	101·1	101·2	101·4
August 20th, 1895—						
Violette	10 "	101·1	100·3	101·	101·	101·
Miss Eden	10 "	100·3	100·3	100·4	101·	101·1
Aaggie Cornelia 3rd	10 "	101·3	101·	101·	101·	101·
Princess	10 "	100·4	101·	100·4	101·	101·1
Belle of Glen Duart	10 "	101·	100·4	101·3	101·3	101·2
August 27th, 1895—						
Violette	15 "	101·2	101·	101·	101·	101·
Miss Eden	15 "	103·	101·	100·4	101·3	102·
Aaggie Cornelia 3rd	15 "	101·1	100·4	101·	101·1	102·
Princess	15 "	102·2	102·3	103·	103·3	103·4
Belle of Glen Duart	15 "	101·1	101·	101·1	101·1	101·1
September 3rd, 1895—						
Violette	15 "	101·1	101·	101·2	101·2	102·
Miss Eden	15 "	101·2	101·2	101·3	101·3	101·4
Aaggie Cornelia 3rd	15 "	101·2	101·1	101·	101·2	101·4
Princess	15 "	101·4	101·1	101·2	101·4	102·4
Belle of Glen Duart	15 "	101·1	101·1	101·1	101·1	102·1
September 10th, 1895—						
Violette	15 "	101·4	101·	101·4	101·4	102·
Miss Eden	15 "	101·2	101·1	101·2	101·3	101·2
Aaggie Cornelia 3rd	15 "	101·3	101·2	101·2	101·2	101·
Princess	15 "	101·1	101·1	101·	101·2	101·1
Belle of Glen Duart	15 "	101·1	101·2	101·3	101·3	101·4

TUBERCULIN TEST—*Concluded.*

Name of Animal and Date of Injection.	Quantity of Lymph Injected.	Temperature. Normal.	After Injection.			
		8 p.m.	6 a.m.	9 a.m.	12 a.m.	3 p.m.
September 17th, 1895—						
Violette	15 minims.	101·1	101·	101·	101·3	101·1
Miss Eden	15 "	100·4	100·4	101·1	101·3	101·2
Aaggie Cornelia 3rd	15 "	101·	101·1	101·1	101·2	101·1
Princess	15 "	101·3	101·3	101·3	102·1	102·
Belle of Glen Duart	15 "	101·2	100·4	101·1	101·4	101·4
September 24th, 1895—						
Violette	20 "	101·	100·3	100·3	100·4	101·
Miss Eden	20 "	101·1	101·2	101·2	101·1	101·1
Aaggie Cornelia 3rd	20 "	101·3	101·1	100·3	100·4	101·1
Princess	20 "	101·2	101·	100·4	101·1	101·
Belle of Glen Duart	20 "	100·3	101·	101·1	101·1	101·4
October 1st, 1895—						
Violette	20 "	101·	100·3	100·4	101·	101·1
Miss Eden	20 "	101·	101·2	101·2	101·4	101·4
Aaggie Cornelia 3rd	20 "	101·1	101·1	101·	101·	101·1
Princess	20 "	101·1	101·	101·1	101·2	101·2
Belle of Glen Duart	20 "	101·2	101·	101·2	101·4	101·4
October 8th, 1895—						
Violette	20 "	100·4	100·2	100·3	100·2	101·1
Miss Eden	20 "	100·1	101·	101·1	100·4	101·3
Aaggie Cornelia 3rd	20 "	100·3	100·3	100·4	101·	101·1
Princess	20 "	100·1	100·3	101·	101·	101·2
Belle of Glen Duart	20 "	100·3	100·2	101·	100 3	101·3
October 15th, 1895—						
Violette	20 "	101·3	100·3	100·3	101·1	101·
Miss Eden	20 "	101·1	101·1	101·1	101·2	101·
Aaggie Cornelia 3rd	20 "	101·3	101·1	101·1	101·2	101·2
Princess	20 "	101·1	101·	101·	101·2	101·3
Belle of Glen Duart	20 "	100·3	100·2	100·3	101·	101·3

After this all treatment was discontinued, but the isolation of these animals was carefully carried on until August 7th, 1896, when, acting under the instructions of the Minister of Agriculture, two of these animals, Princess and Belle of Glen Duart, were slaughtered. These were selected for the first test by slaughter for the reason that they had shown slight symptoms of the presence of the disease, by occasional coughing. Nevertheless, they remained in fair condition. The *post mortem* was made under the superintendence of Dr. D. McEachran, Chief Veterinary Inspector for the Dominion, and the following is a brief description of the internal condition of each of these animals:—

Princess, Shorthorn grade.—The *post mortem* examination showed the lungs of this animal to be sound. The liver was slightly affected. On the surface of the latter there were a number of small yellow spots, which, when cut into, were found to cover, in some instances, tuberculous deposit extending into the substance of the organ. The thoracic glands were much enlarged and filled with calcareous tubercle. The surface of the left side of the interior, both of the thorax and abdomen, was thickly covered with grape-like or miliary tubercles. These were so crowded together, in many places, as to completely cover the surface and, in some instances, overlap each other. The mesenteric glands were also slightly affected with tubercle.

Belle of Glen Duart, Jersey.—In this case one lung was badly diseased, discharging, when cut across, a large quantity of pus-like tubercle, which oozed out from a large number of different points in the cut surface of the organ. The liver was slightly affected. Tubercle was abundant in the thoracic glands, which were enlarged. It was also found in the mesenteric glands.

On August 11th and 12th, the remaining three animals were again tested with tuberculin, (50 minims being injected in each case) with the following results :—

Name of Animal.	Temperature.							
	Normal.	After Injection.						
	6 p.m.	8 p.m.	5 a.m.	8 a.m.	11 a.m.	2 p.m.	5 p.m.	6 p.m.
Aaggie Cornelia 3rd	102·1	102·	101·1	102·2	105·2	105·3	105·2	104·3
Miss Eden......................	101·4	101·4	101·4	101·4	101·4	101·4	102·2	102·4
Violette..........	101·4	101·4	101·4	101·1	101·1	101·2	102·1	102·

These were slaughtered on August 15, under the supervision of Dr. A. Smith, Chief Veterinary Inspector for Ontario. The following notes were taken at the *post mortem* :—

Miss Eden, Devon.—In this animal the lungs were scarcely affected ; but the entire substance of the liver was more or less diseased, being filled with cysts of varying size, some of which were full of creamy tubercle and others cheesy in their character, while others were quite fluid and pus-like. The bronchial glands were also enlarged and filled with tubercle of varying degrees of consistence.

Aaggie Cornelia 3rd, Holstein.—In this case both lungs and liver were found to be in a healthy condition. The thoracic glands were also normal in size and healthy. The only tubercle discovered was in one of the intestinal glands, where the deposit was found in moderate quantity.

Violette, Canadian.—The viscera of this cow was carefully examined and all the larger organs found to be healthy. In one of the thoracic glands there appeared to be a slight deposit, but it was not far enough advanced to be clearly demonstrated as tubercular.

VISITS TO THE BRANCH EXPERIMENTAL FARMS.

VISIT TO BRANDON, MANITOBA.

The Experimental Farm at Brandon was visited in the beginning of September on the way going west, and again on the return journey at the end of that month. The crops on this farm appeared to be above the average in yield, but inferior in quality of grain on account of lodging and rust, conditions brought about by the unusual quantity of rain which fell earlier in the season. Many of the varieties of oats suffered severely from rust, which affected both leaf and straw, inducing a more or less shrivelled condition of the grain. The crops of field roots were very heavy, and many varieties of corn gave excellent results. The season was favourable for the growth of grasses, and the crop of the Awnless Brome Grass, *Bromus inermis,* was very satisfactory. A considerable quantity of the seed of this useful grass was saved which is being supplied to farmers for further test in different parts of the province. The many plots of small fruits have yielded well, and good progress has been made with the experimental plantations of selected trees of the wild plum, and with special selected forms of the sand cherry. The season was favourable for tree growth, and the belts, blocks and avenues of forest trees have all made good progress. The live stock in all branches was found in a good state

of health, and the general condition of the grounds and buildings and the satisfactory progress which has been made in all branches of the work, gave evidence of good care and management.

VISIT TO INDIAN HEAD, N.W.T.

The agricultural outlook at this farm and throughout the neighbourhood was exceptionally good. The amount of rainfall during the season, although somewhat heavier than usual was little more than sufficient to bring the crops to perfection, and the yield of all sorts of grain was unusually large. The different varieties of wheat gave returns of from 36 to 46¾ bushels per acre ; the most prolific sorts of oats yielded from 90 to 108 bushels per acre, and one field of 20 acres of the variety known as Banner gave a total crop of 1,958 bushels, equal to 97 bushels 21 lbs. per acre. Barley also did well, the different sorts tested having varied in yield from 48 to 73 bushels per acre. The wheat crop of the Indian Head district is said to have averaged about 40 bushels per acre on all summer fallowed land and about 25 bushels on spring and fall ploughing, a large proportion of which will grade No. 1 hard. A drive was taken of about 40 miles through the district known as the Pheasant Plains and the fields everywhere promised a most abundant return. The crops of roots on the experimental farm have been good, so also has the Indian corn. The mixed grain crops grown for fodder have produced heavily and the Awnless Brome Grass has given an excellent return. This promising grass has now been tested over a wide area in the North-west country and everywhere it has done remarkably well, has proved hardy, grown vigorously and shown its adaptability to the climate by producing large crops of hay and excellent pasture. There are now about 70 acres under this grass at the Indian Head farm.

Small fruits have given good returns. The forest trees which have been planted, of which there are now more than 120,000 in shelter belts, blocks, hedges and avenues are doing well and their growth has entirely changed the aspect of this farm, so recently a bare prairie section. In the shelter these plantations afford crops can be grown to greater advantage than on the open plain, thus demonstrating the usefulness of tree planting in that country. The stock is doing well and the animals all appeared to be well cared for and in excellent health.

VISIT TO AGASSIZ, B.C.

Agassiz was reached on the 1st of September. The grain crops at the experimental farm and throughout the coast climate of British Columbia generally were below the average and the crops of fruit were lighter than usual. Both grain and fruit were injured by a period of cold wet weather, which began about the middle of May and continued for a month. Under these circumstances the fruit trees which were full of blossom, set their fruit sparingly and the growth of the grain was retarded. Following this the weather became unusually hot and dry, and the drought which continued almost without a break until the middle of September ripened the grain prematurely and prevented the fruit from attaining its usual size and quality. Notwithstanding these disadvantages a large quantity of fruit has been produced in British Columbia and the shipments to the North-west Territories and Manitoba have been heavy. The area under orchard in this province has been much increased during the past few years and the fruit crop is increasing in importance annually. Freight rates have been reduced and methods of packing improved, and most of the fruit has reached its destination in good condition and given the growers satisfactory returns.

A week was spent at Agassiz inspecting the progress of the work there, and arranging plans for the future. The efforts which have been made to gain information as to the relative value and productiveness in that climate of a large number of varieties of all the more important agricultural crops have been attended with satisfactory results. The fruit orchards have been greatly extended by large additions to the collection during the past year. Nearly 600 varieties have been added, which brings the number of different sorts of fruit under test to about 2,000, nearly two-thirds of which are large fruits. The trees form ingthe recent additions have been obtained chiefly from nurseries

in Germany, and consist of collections of European apples, pears, plums, cherries, apricots and nuts, very few of which have yet been tested in this country. The results of these extensive experiments are already of much value to the fruit growers of British Columbia, giving them needed and reliable information as to many of the varieties which are likely to prove remunerative. Most of the plums were in fruit at the time of my visit and some of the newer sorts were found to be very promising as bearers and shippers and of good quality. The orchards on the higher bench lands on the sides of the mountain are making good progress, many of the trees fruited during the past season and both foliage and fruit have been freer from insect and fungoid attacks, than those in the orchards in the valley.

THE NICOLA VALLEY.

On the return journey a visit was paid to the Nicola Valley, one of the dry districts in British Columbia and the ranches in that valley seen for a distance of about 40 miles from the mouth of the river. In this locality all cultivated crops are grown by irrigation. This territory is favourable for ranching and large bands of cattle are fed on the bunch grass which grows on the hillsides. Mining operations are attracting much attention here and many claims have already been located on Boundary Creek, a short distance south of this valley.

AT CALGARY.

A day was also spent at Calgary where inquiries were made regarding the progress of irrigation, so much needed in that part of Alberta, and some of the crops examined which have been grown during the past season on irrigated land. The results are very encouraging. From information given by Mr. J. S. Dennis, the government engineer in charge of irrigation surveys, it was found that 115 canals and ditches have already been constructed, measuring 230 miles, these are in operation. The number of acres which can be irrigated by these ditches is 79,300. It was further ascertained that 45 additional ditches are in course of construction measuring 173 miles and that these when finished will be capable of irrigating additional land to the extent of 84,250 acres. This work has been done under government supervision in accordance with the Irrigation Act but by private funds.

Surveys have been made by the government engineers during 1895–96 for the following additional canals: Bow River canal, length 40 miles, area capable of irrigation, 300,000 acres; St. Mary Canal, length, 50 miles, area which may be irrigated, 50,000 acres, and Red Deer Canal, length, 47 miles, with a capacity for irrigating 50,000 acres. The land throughout this district is very fertile and with a sufficient water supply very large crops of fodder and grain can be grown. The extension of the irrigated area will offer increased facilities for the raising of cattle and horses and will also afford sustenance for a large population.

VISIT TO EDMONTON.

The district between Calgary and Edmonton was also seen and several days spent at the latter place, inquiring into the progress of agriculture there. Much advancement has been made all through this district since my last visit three years ago. Several new towns have been built, and many homes of settlers were seen in the midst of cultivated fields where on the former visit the country was unbroken. The crops on the whole were good and the quality and yield of grain above the average. Many excellent samples of wheat were sent to me after the threshing was over, especially from the Edmonton district. Increased attention is given to the raising of cattle, horses and swine, for all of which there is a great abundance of food and a ready sale. This branch of farming will admit of unlimited extension here and seems to be both reliable and profitable.

VISIT TO THE DAUPHIN LAKE DISTRICT.

On returning to Brandon, Man., a drive of about 250 miles was taken in company with the superintendent of the experimental farm at Brandon, Mr. S. A. Bedford, through the northern part of Manitoba to gain information regarding the Lake Dauphin district. Taking the east trail by way of Neepawa, wheat is grown to good advantage for some miles north, and beyond this the land along the higher altitudes is good for cattle ranching for the greater part of the route. Some good crops of oats and barley are also grown in portions of this district. After the first 20 or 25 miles the land becomes well covered with timber with occasional openings of plain or scrub. The trees are chiefly poplar, with some spruce and tamarack. About half way to Lake Dauphin the line of railway now under construction was reached. The rails were laid nearly 60 miles from the starting point at Gladstone, and for about 30 miles beyond this gangs of men and teams were grading successive sections of the road.

On approaching Lake Dauphin the country becomes more open and about the lake there are fine stretches of hay land. Within a few miles of Gartmore the land is a little more elevated and becomes quite park-like in character with large stretches of prairie and intervening clumps of trees and scrub. The soil here is rich and fertile, and excellent crops of wheat and other grain are grown. At the time of this visit most of the grain had been stacked, there were, however, some fields recently cut still in stook where samples were taken, and all were found uninjured by frost, save one, which was but slightly affected. The country northward, through the Gilbert plains, comprises a large area of excellent land, and notwithstanding that it is further north yet, on account of its low altitude and the proximity of large bodies of water, this district will probably prove as suitable for wheat growing as some of the more favoured localities in the central parts of the province, and as soon as it becomes easily accessible by rail, settlement will no doubt proceed rapidly.

The return was made by the trail across the Riding mountains to Strathclair, through many miles of woods containing the finest growth of poplars I had ever seen, with considerable quantities of spruce and tamarack, mainly on the southern slopes. The roads, however, were terrible. They would, no doubt, be got over with moderate ease in winter, when the hundreds of deep mud holes are frozen and the fallen logs partly covered with snow, but at this season of the year it must be travelled to be understood, and the individuals are fortunate who reach the end of their journey with vehicle and harness sound. There is no settlement along most of this route and, in one instance, no stopping place for a distance of 40 miles, and this when reached was a log shanty so uninviting that the party preferred to spend the night in the frosty air, sleeping in the shelter of some stacks of straw.

ORNAMENTAL TREES AND SHRUBS AT THE CENTRAL FARM.

The large and varied collection of ornamental trees and shrubs which have been accumulated at the Central Farm at Ottawa is proving a constant source of pleasure to all who come in contact with them. Only nine years have passed since this planting was begun, and the change effected in the landscape by the rapid growth and development of these trees and shrubs is a pleasant surprise. The number of varieties which are proving hardy, and suitable for this climate, is much larger than was at first expected, and their growth has been more vigorous. The number of specimens which have been planted along the roads from the entrance gates to and about the buildings is 2,742, and the number of species and varieties among these is about 400. With so many different types of beauty spread out on every hand, the visitor finds objects of interest to claim his attention at every point, and the judicious grouping of specimens has brought together harmonies in regard to form, as well as colour, which are pleasing to the eye, and produce a favourable impression on the mind. The accompanying plate has been prepared from a photograph taken in June, 1896, showing a part of this ornamental grouping, about half-way between the entrance gate and the office building.

Group of ornamental trees and shrubs on Central Experimental Farm.

The central and prominent object in this case is a specimen of the cut-leaved birch, a very graceful tree, which succeeds remarkably well at Ottawa.

CHANGES IN THE STAFF.

During the past year, two important changes have been made in the staff. The Central Experimental Farm has lost the valued services of Prof. J. W. Robertson, who resigned his position as Agriculturist, and has removed to offices in the departmental quarters in the city, where he fills the position of Agricultural and Dairy Commissioner. The superintendent of the branch experimental farm at Nappan, Mr. William M. Blair, who had filled that position acceptably for nine years, resigned early in the year, and Mr. George W. Forrest was appointed in his place.

INJURY TO CHEMICAL LABORATORY BY FIRE.

On the evening of the 6th of July, about 6 o'clock, a fire was discovered in the chemical laboratory at the Central Farm, which, on account of the inflammable character of the material it contained, spread with such rapidity that in a few moments the whole interior was filled with flames. By energetic and united effort on the part of the officers and workmen, a stream of water was promptly brought to bear on the blazing building, and the fire was extinguished before the fire brigade from the city arrived. The interior of the building was badly burnt, and nearly all the apparatus and stock of chemicals destroyed. The fire originated from the bursting of a flask in which a sample of barn-yard manure, in process of analysis, was being boiled in sulphuric acid, the operation being conducted in a leaden chamber. The boiling acid fell on the rubber tubing used to convey the gas to the burner, and partially destroyed it ; when the large volume of gas liberated mixed with the air, and several explosions followed, which shattered the leaden chamber, and distributed the burning contents in every direction.

Owing to the inflammable character of the material necessarily used in conducting chemical operations, it is very desirable that a separate structure be erected, in which to carry on in future this important branch of the work, with provision for making it fire-proof.

CORRESPONDENCE.

The following is a summary of the letters received and despatched at the Central Experimental Farm from November 30th, 1895, to November 30th, 1896, also of the number of reports and bulletins sent out by mail during the same period :—

	Letters received.	Letters sent.
Director	12,271	11,289
Agriculturist and Dairy Commissioner (Nov. and Dec. only)	722	443
Horticulturist	2,177	2,515
Chemist	1,116	1,047
Entomologist and Botanist	2,083	2,004
Poultry Manager	1,680	1,396
Accountant	1,285	1,213
	21,634	19,907
Circulars sent with samples of seed grain		35,489
Number of Reports and Bulletins mailed		162,642

ACKNOWLEDGMENTS.

I gratefully acknowledge the receipt of another valuable collection of seeds of trees, shrubs and plants from the Royal Gardens, Kew, England, also of a number of packages of seeds of rare and interesting species from the Arnold Arboretum Jamaica Plains, Mass.,

and of Japanese trees, shrubs, and plants from the Royal Botanic Gardens at Sapporo, Japan. Many thanks are also due to Prof. John Macoun, Botanist of the Geological Survey and to Mr. J. M. Macoun, Assistant Botanist, for seeds of many rare and useful species collected in different parts of the Dominion and to Comm. Thomas Hanbury, proprietor of the well-known gardens at La Mortola, Ventimiglia, Italy, for an interesting collection of the seeds of greenhouse plants and hardy perennials.

I also desire to acknowledge the continuance of the faithful service rendered me in the past by all the officers of the Central and Branch Experimental Farms, and for their earnest and diligent co-operation in carrying on the many lines of experimental work planned.

A special acknowledgment is due to those members of the staff who have rendered me efficient aid in the carrying on of those branches of the work of which I have personal charge. To the Farm Foreman, Mr. John Fixter, who has managed and watched over the field experiments and made careful notes on the crops at different stages in their growth; to my assistant, Mr. W. T. Macoun, who as Foreman of Forestry has supervised the work required to be done in connection with the forest belts, avenues, hedges and general ornamental planting, has had charge of the Arboretum and Botanic Garden and also of the uniform test plots of grain and potatoes, and taken records of the growth and yield of the many varieties under test. I have also received much valued assistance from Mr. R. R. Elliott, herdsman, in connection with the carrying on of experimental work with cattle and swine. Faithful and accurate work has also been performed by Mr. W. T. Ellis, who has had the care of the seed testing and propagating houses and has taken the meteorological records, also by Mr. J. Kirkpatrick who has conducted the work of the distribution of samples of seed grain. The employees also in every department of the work have discharged their several duties faithfully and well.

WM. SAUNDERS.
Director Dominion Experimental Farms.

REPORT OF THE HORTICULTURIST.

(John Craig.)

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit a report of some of the work carried on by the Division of Horticulture of the Central Experimental Farm for the year 1896.

Fruit Crop.

The fruit crop as a whole has been unprecedentedly large in all parts of Canada, with the exception of peaches which, owing to severe frosts occurring the latter part of the winter were a light yield on Lake Ontario between Niagara and Hamilton. The crop of apples and plums was truly extraordinary in many portions of Ontario, and heavy in all parts. Owing partly to faulty distribution and partly to the low prices prevailing in foreign, as well as in domestic markets, in many districts large quantities of apples were not harvested. The number of barrels of apples exported to the British markets this year, so far as can be learned from shipping records, has greatly exceeded that of previous years. It is regrettable that with such a large crop of fruit of really fine quality, so many complaints regarding the manner of packing and the faulty character of the fruit should have been made, based too frequently upon apparently justifiable evidence. The vast quantity of fruit in sight in the autumn appears in many instances to have encouraged carelessness upon the part of packers, instead of calling for more conscientious and careful methods of culling and grading. Home markets are filled—almost glutted—with Baldwins, Greenings and Spys, but it is often difficult to purchase a barrel that will turn out an even No. 1 grade throughout.

Keeping Quality.—Frequent complaints are now (Jan. 15th) being made by dealers that the standard winter varieties just mentioned are not keeping as well as usual. The keeping qualities of all varieties are always much influenced by the character of the weather which prevailed during late summer and autumn and at the time of picking. The past season was not an unfavourable one in that respect. The cause of the early decay of winter varieties this year, therefore, should be credited to the time of harvesting and the manner of handling the fruit afterwards. I am of the opinion that much of the crop of 1896, was injured by being allowed to hang on the tree too long. This treatment encouraged ripening to the fullest extent, and while the quality of the fruit for the time being was improved, its keeping properties were much impaired. If picked when fully grown, with pips well coloured, though the skin may not have developed its richest tints, carefully graded and placed in cool, well ventilated cellars, colour will deepen and quality improve, and in most cases the fruit may be preserved satisfactorily. This treatment, except as to the time of picking, is more particularly applicable to fruit intended for domestic consumption or for exportation late in the autumn, than to that which is immediately sent out of the country. Many experienced shippers pack and ship directly from the orchard, others fill the barrels and head them in the packing house after the apples have "sweated,"

It would seem reasonable to suppose that shipments made under the latter method of treatment would show fewer "slacks" and "wets" in the Liverpool Commission Agent's Reports, than those handled according to the first system. It is undoubtedly true that a considerable percentage of "slacks" and "wets" should be charged to rough handling and unsuitable accommodation on board ship.

Peaches.—The area devoted to the cultivation of this luscious fruit is rapidly extending in Ontario. Peach orchards are replacing apple orchards in the South Lake Ontario district. In Essex County too, the industry, though comparatively new, is growing with great rapidity. There appears to be no reason to doubt the statement that Ontario will in the near future produce enough peaches to supply, if furnished with adequate transportation facilities, the entire Canadian region lying east of the Rocky Mountains.

Frost Injuries of the Winter of 1895-6.—Last winter was abnormal in many respects. The low temperatures of December and January, finding the roots of the trees unprotected by our customary snow blanket, caused the death of many fruit trees. These fatalities, with preventive remedies, have been duly recorded in the chapter on "Root Killing" in the body of the report.

Work of the Year.—It is a pleasure to report increased interest in the work of this division, by fruit growers and farmers. This is evidenced by the large correspondence bearing upon topics of vital importance to the growers of fruit and vegetables. Many specimens injured by plant parasites have been received, and remedies suggested; a large number of seedling fruits has been received and their merits passed upon by the Horticulturist, who in this work is pleased to acknowledge the valuable co-operation of Mr. L Woolverton, Secretary of the Ontario Fruit Growers' Association, and Mr. H. L. Hunt, Lecturer and Instructor in Horticulture of the Ontario Agricultural College, Guelph. Many samples of fruit also were sent in for identification. These were examined and named as far as possible.

Special Investigations.—During the year, certain investigations have been made with regard to special attacks of plant diseases, causing more or less widespread loss to fruit growers and farmers. One of the most important of these related to the pea crop of Prince Edward County. Here field and garden varieties of pease are grown extensively under contract for seed dealers. The industry, which is an important one, amounting probably to $200,000 or more per annum, has been seriously injured in recent years by a malady or disease which attacks the pea plant soon after the blossoming period, causing its immediate death, or so weakening the plant as to prevent the normal development of the seed. A careful examination of the infested fields was made by Mr. F. T. Shutt, Chemist, and myself. Samples of soil and diseased plants were collected. The former have not been examined thus far. The latter underwent careful microscopic examination at the hands of Mr. J. Dearness of London, Ont., who has with great kindness repeatedly given me valuable assistance in the identification of fungous diseases. Thus far, only suggestive points upon which to work in connection with the trouble have presented themselves. Conclusions based upon our necessarily superficial survey would be premature. It would appear, however, that (1) those fields which have been cropped oftenest are more seriously affected, and (2) that certain varieties show almost perfect immunity, while others exhibit a marked tendency to be affected by the disease. Among the latter class may be mentioned Early Kent. So far, a judicious rotation of crops seems to be the only practical remedy, although a careful trial of the use of mineral fertilizers is to be recommended. It is hoped that this important matter may be fully investigated the coming season, by experiments inaugurated and carried out upon these lines.

Blossoming Records.—The work of recording the blossoming period of our leading varieties of large and small fruits throughout the Dominion has been carried on again with the kind assistance of my fruit growing friends. I regret to say that it has not been found possible to compile and condense these records in time to include them in the annual report. It is hoped that the average results gained after another season's

work will so enhance their value as to render a separate publication desirable. I wish to acknowledge very gratefully the effective help rendered by the following fruit growers :—

Provinces.	Recorder.	Residence.
Prince Edward Island	J. Johnstone	Long River.
	J. T. Weeks	Alberton.
	Hon. David Laird	Charlottetown.
	F. McRae	Pownall.
New Brunswick	W. W. Hubbard	Sussex.
	G. U. Hay	St. John.
Ontario	Thos. Beall	Lindsay.
	Richard Trotter	Owen Sound.
	J. P. Cockburn	Gravenhurst.
	W. H. Pettit	Grimsby.
	E. B. Edwards	Peterborough.
	G. E. Fisher	Freeman.
	G. Nicol	Cataraqui.
	B. Gott	Strathroy.
	Capt. J. Shepherd	Queenston.
	E. Morden	Niagara South.
Nova Scotia	Geo. Thompson	Wolfville.
	C. E. Brown	Yarmouth.
	Rev. H. How	Annapolis.
	W. Saxby Blair	Nappan.
	W. C. Archibald	Wolfville.
	R. W. Starr	do
	S. C. Parker	Berwick.
Quebec	Asa Johnston	East Farnham.
	W. M. Pattison	Clarenceville.
	C. P. Newman	Lachine Locks.
	J. C. Chapais	St. Denis.
	R. Brodie	Montreal.
	J. M. Fisk	Abbotsford.
British Columbia	Thos. Daly	Keremeos.
	J. R. Anderson	Victoria.
	W. B. Anderson	Comox.
	Theodore Trage	Salt Spring Island.
	Henry Kipp	Chilliwack.
	T. G. Earl	Lytton.
	Richard Layritz	Near Victoria.
	Tom Wilson	Vernon.

Meetings Attended.—I was present by invitation and gave addresses at the following provincial organizations :—

Nova Scotia Farmers' Association, January 21st. Nova Scotia Fruit Growers' Association, meeting held at Wolfville, January 22nd, 23rd and 24th. Quebec Pomological Society, St. John, February 12th and 13th. Quebec Pomological Society, St. Jean Port Joli, September 24th and 25th. Ontario Fruit Growers' Association, Kingston, December 2nd, 3rd and 4th.

An important series of meetings was held in Prince Edward Island during the last week in January and the first week in February. The meetings were most successful, and to His Honour Lieut.-Governor Howlan, and Mr. T. J. Dillon, Supt. of Dairying on the Island, and the various local committees is due the entire credit. It is hoped that the interest aroused on the island will be kept fully alive through the agency of the Provincial Fruit Growers' Association, lately organized.

Acknowledgments.—I am deeply indebted for valuable assistance rendered during the year, to the following eminent scientists, Dr. B. D. Halsted, Botanist and Horticulturist, Experiment Station, New Brunswick, N.J., U.S. : Prof. B. T. Galloway and Dr. Erwin F. Smith, of the Division of Vegetable Pathology, Department of Agriculture, Washington, D.C., U.S. ; Prof. L. R. Jones, Botanist, Experiment Station, Burlington, Vt., U.S. ; Prof. A. D. Selby, Botanist and Chemist, Experiment Station, Columbus, Ohio, U.S. ; Prof. L. H. Bailey, Horticulturist, Cornell University, Ithaca, N.Y., U.S. ; and Mr. J. Dearness, Inspector of Schools, London, Ont.

Donations.

I beg gratefully to acknowledge the receipt of cuttings, plants, scions, seeds, implements, &c., as follows, from Canadian fruit growers and nurserymen; also from enthusiasts in horticultural work residing in the United States.

Sender.	Donations.
1. Aylmer Iron Works, Aylmer, Ont.	1 spraying pump.
2. Allen, A. McD., Goderich, Ont	Scions, apples; Jordan, Breckenridge.
3. Anderson, J. R., Dept. of Agriculture, Victoria, B. C.	Native *Ribes—Lobbii, divaricatum, lacustre, sanguineum, bracteosum.*
4. Anderson, Mr. Hamilton, Ont.	Cuttings, gooseberry; Drum major, Fiddler, Full moon, London, Whitesmith, Yorkshire Green.
5. Burns, John, St. Foye Tollgate, Quebec.	Cuttings, chrysanthemums.
6. Brown, C. E., Yarmouth, N.S	Seeds of palms.
7. Bruner, M. G., Olinda, Ont.	Grapes, 2 vines "Bruner."
8. Ball & Colquhoun, Knowlton, Que.	Seeds, vegetable; beets, Stinson, Danish Sugar; beans, Day's leafless; carrot, Red meaux; corn, Early Quebec Sweet; tomatoes; Fordhook First.
9. Burgess, Thos., Bala, Ont	Scions, crab, "Burgess."
10. Black, R. J., Bremen, Ill., U.S.	Bud sticks, peaches; Miss Lola, June Rose, Onderdonk, Boquett Free.
11. Conn, John, Kemptville, Ont	Trees, apple: Scarlet Pippin, Haas, scions, McIntosh Red.
12. Crandall, Franklin, Lindsay, Ont	Scions, apple, Empress, Red Rock.
13. Cuppage, J., Orillia, Ont	" Diamond No. 4.
14. Claire, F. H. P., Rideau Centre, Ont.	" "Joe Pattie."
15 Dempsey, W. H., Trenton, Ont.	" Ontario, Pear; Flemish Beauty.
16 Edwards, E. B., Peterborough, Ont.	" Blenheim Pippin.
17 Graves & Son, H. O., St. Joseph, Mo., U.S.	" Longevity.
18 Gordon, J. K., Whitby, Ont.	Cuttings, grape; Whitby.
19 Gault, W. C., Ruggles, Ohio, U.S	Plants, raspberry; 6 Gault, B.Cap.
20 Gill, J. H., Charlottetown, P.E.I.	Scions, apples; Seedling.
21 Graham, J. I., Vandeleur, Ont	" green seedling.
22 Grierson, G. H., Oshawa, Ont	Scions, *Crataegus.*
23 Gerrish, O. K., Lakeville, Mass.	Scions, apple, Arctic.
24 Hansen, N. E., Prof., South Dakota, Exp. Station, Brookings.	Seeds, Vladimir cherry.
25 Hoover & Gaines, Dayton, Ohio.	Peach trees, Champion, jr; plants, raspberry, 2 Dayton Early.
26 Howard, Capt. A. L., Capleton, Que.	Scions, apple, winter variety.
27 Hoover, D. B., Almira, Ont.	" Hoover Weeping, Lady Washington, Hoover Red.
28 Hales, Hy., Ridgetown, N.J., U.S.	Seeds; thin-shelled hickory nuts.
29 Johnson, J. D., Miranda, Que.	Scions; Red Fameuse.
30 Johnson, John, Long River, New London, P.E.I.	Scions; apple, Winter Bough.
32 Kerr, W. J., Renfrew, Ont.	Scions, apples:—Forrest No. 1; Knight's No. 1. Knight's Winter; " 2; " 2. " Russet; " 3; " 3. " Greening; " 4; Fraser's No. 1. Stewart's No. 1; " 5; " 2. " 2; McCallum No. 1.
32 Leef, W. H., Orillia, Ont.	Seedling apple.
33 Livingston, L. L., Frankville, O.	Seed of Honey Locust.
34 Mills, Charles, Fairmount, N.Y	Raspberry plants, 12, Onondaga, B.C.; do 12, No. 15, B.Cap.
35 Morse, S. P., Milton, Ont	Scions, apple, "Boys Delight."
36 Niemetz, Jarsolav, Conseilier d'Etat Winnitza, Podolie, Russia.	Large collection of scions. Apples—R. de Winnitza, Grafenst Red, Antonovka I. P., Pirus Spectabilis, Grafensteiner, Spasovka, Annis Rose, Voronesh Sablonka, Gr. D. Michel, Aport (White), Dop. Prinz, Diester, Olga Onikov. Pears—Princesse, Bessemianka, Long, Rylsk, Ordynka, Bergamotte, Beurré Roman, Sapieganka, Flutsk, Krivonogov, Mitschurin, Bonchretien, Tonkovietka, Lemon.
37 Pettit, A. H., Grimsby, Ont	Seeds, Bignonia radicans.
38 Roberts, J. D., Cobourg, Ont.	Scions, apple—Reinette du Canada, Prince Albert, The Queen, Peasegood Nonsuch, Devonshire Quarrenden, Lord Suffield, Bedfordshire Foundling. Scions, pears—Fertility, Wilmot, Beurré Baltet, Marguerite Marillat, Beurre Chaudy, Directeur Alphande, Beurre de Martillet.
39 Ramsay, A. J., Central, Lot 16, P.E.I	Scions, Apple No. 1 and No. 2.
40 Reid W. C., Belleville, Ont.	Scions, apple. Ontario.

DONATIONS—*Concluded.*

Sender.	Donations.
41 Smith, A. M., St. Catharines, Ont	Plants, gooseberry ; Pearl.
42 Van-Lindley, J., Pomona, N.C., U.S.	Trees, peach ; 2, Musser.
43 Williamson, W. J., Port Nelson, O	Scions, apple ; seedling.
44 Whitten, C. E., Bridgeman, Mich	Plants, strawberry ; 12, Satifsaction.
45 Williams, Thos., Orillia, Ont	Scions, apple ; Keane's Seedling.
46 Waters. J. M., Fernhill, Ont	Tips, raspberry ; 4, Triumph.
47 Yeisley, Charles, Lisbon, Iowa	Scions, apple ; Springdale, Allen's Choice, Banana, American Blush, Milding, Isherwood, Kohl's Early.

I have the honour to be, sir,
Your obedient servant,

JOHN CRAIG,
Horticulturist.

THE GRAPE.

The rapid development of the grape industry in America is without a parallel in the history of horticulture. This marvellous growth has been brought about by the ease with which the wild grape may be improved, and as a result of the application of intelligent effort. Within forty years have been produced, by patient effort and through chance production, more than 75 per cent of the 165 varieties described in the tabular statement in connection with this article. The following pages on this subject are directed to beginners in grape growing, to whom I trust it may prove helpful. The grape is exceedingly variable in its behaviour, and is more dependant for perfect success upon soil and climatic conditions than most of the edible fruited plants. For this reason it is not wise to place too much weight upon an opinion gained by testing a variety in a single locality. Slight differences in soil and aspect often create great modifications in the character of the fruit.

In the matter of the production of new varieties by the art of hybridization, as Canadians we may point with pride to the good systematic work done by a few of our foremost growers, some of whom we now regret to have to number with the honoured dead, Charles Arnold, of Paris, Ont. ; Peter C. Dempsey, Trenton, Ont. ; Robert Burnet, Hamilton, Ont., and W. H. Mills, Hamilton, Ont., all did excellent work in this line. The good work commenced by Prof. Wm. Saunders at London, Ont., has been continued by him in his capacity as Director of the Dominion Experimental Farms and is now bearing fruit.

There is still need for better varieties than we yet have—hardy early ripening kinds of good quality, suitable to the comparatively short season characteristic of Eastern Ontario and the province of Quebec. This work should be perseveringly pushed on till such varieties as Champion and Florence are supplanted. It is remarkable to note that growers, even in the most favoured portions of Ontario, find Champion one of the most profitable varieties. Happily, the market for grapes of this quality is comparatively limited, as they are soon crowded out by the more palatable varieties that follow closely upon their season of ripening.

The Botanical position of the Grape.—Grapes belong to the genus *Vitis,* order *Ampelidæ.* Numbers of this genus are found in nearly all parts of the globe, with a few notable exceptions, as for example, Africa, Australia and South America. The classification of the species making up the genus *Vitis* has been a subject of some controversy.

Systematic botanists and botanical horticulturists are thus far not agreed upon the nomenclature of the species of this genus under cultivation. In the wild

state the grape is exceedingly variable, thus greatly increasing the classificatory difficulties. The botanical descriptions given below are those adopted by Dr. C. E. Bessey, botanist to the University of Nebraska, Lincoln. I have included only those species credited with being the progenitors of the cultivated varieties mentioned in the accompanying tabular statement. Dr. Engelmann, an authority upon the genus *Vitis*, refers to the fact that wild vines frequently bear sterile blossoms.

NORTHERN FOX *Grape (Vitis labrusca,* L.)—"A moderate sized climber, young branches very woolly; leaves large (4 inches to 6 inches wide), thick and of firm texture, entire or lobed, slightly dentate; rusty woolly beneath; berries in compact clusters, large, purple or amber, with a bloom, seeds, plump, heart-shaped, top notched with a groove."

Geographical Distribution.—"Eastern North America, from New England to South Carolina, and westward to the Alleghany Mountains." (Bessey). This species is the parent of the majority of the cultivated varieties of to-day. Its cultivation began about 100 years ago. Among the notable descendants are:—Catawba, Isabella, Diana and Concord, the advent of this latter variety marked an epoch in grape culture. Lindley, Agawam, Barry and other Roger's, hybrids belong to this type.

MUSTANG GRAPE (*Vitis Candicans,* Engel.)—"A tall climber with young branches woolly; leaves, rather large, white cottony below, rounded or five-lobed; berries, large, greenish, purplish, or black, with a bloom. Seeds plump, broadly heart-shaped, top notched with a broad, shallow groove. Geographical distribution Texas, from the Colorado to the Rio Grande, and west to the Pecos" (Bessey). This grape has recently been hybridized with cultivated varieties. One or two apparently valuable varieties have been developed. Elvicand has been favourably reported by the Experimental Station of New York.

SUMMER GRAPE (*Vitis Aestivalis,* Michx.)—"A moderate sized climber, with young branches rounded and sparsely hairy; leaves large (4 in. to 6 in. wide), entire or commonly three-lobed to five-lobed; of firm texture, rusty woolly beneath when young; nearly smooth when mature; berries in compact clusters, one-half inch to three-quarters of an inch in diameter, black with a bloom; seeds plump, heart-shaped, top with a rounded cord, not notched.

Geographical distribution.—New England to Ontario and Minnesota, Southward to Florida, Louisiana and Texas" (Bessey.)

The Summer Grape is the parent of a number of valuable wine grapes. It is more at home in the middle and southern states than in the north. One of them, Eumelan, has done well at Ottawa.

RIVERSIDE GRAPE (*Vitis Vulpina, L. or V. Riparia,* Michx, of the ordinary manuals).—"A vigorous high climbing plant with round branches, in which the woody partitions in the joints are very thin; leaves large, smooth, three-lobed; berries in small compact clusters, small (one-third inch diameter), black with a bloom: seeds plump, heart-shaped, top, with a groove or faint cord, slightly notched.

Geographical Distribution,—Western New England to Quebec, Minnesota and the Eastern slopes of the Rocky Mountains south to Pennsylvania, Kentucky, Arkansas, Texas and New Mexico common throughout Nebraska." (Bessey).

This species is the parent of a large and important class of cultivated varieties characterized by their thin-skinned fruit, their vigour and hardiness of cane. Among them are Clinton, Brant, Canada and Bacchus.

EUROPEAN GRAPE (*Vitis Vinifera, L.*)—"A vigorous climber, with branches smooth, or nearly so; leaves, large, smooth, five-lobed to seven-lobed; berries, in the wild state, small and dark blue; under cultivation, large, with solid flesh of many colours; seeds plump, elongated, top-notched with a grove.

Geographical Distribution.—In its wild state from Asia Minor to Austria, Germany, Belgium, France, south to the Mediterranean Sea, and possibly in Algiers, Oran, and Tunis in Africa. Under cultivation it is now widely distributed." (Bessey). The characteristics of this species are well brought out in the firm fleshed, highly flavoured

Kensington, produced by Dr. Saunders; the equally firm fleshed Mills, by W. H. Mills, of Hamilton, Ont., and in Secretary, produced by Jas. S. Ricketts, of Newburg, N.Y., U.S.

Propagation.—Grapes are among the easiest of the fruits to propagate. The usual method is by cuttings. A cutting is a piece of cane of one season's growth, containing three or four buds, usually nine to twelve inches in length. Cuttings are made in the fall from the strongest and best ripened wood after the annual pruning has taken place. The base of a bud forms the lower end of a cutting—roots are more readily emitted at this point. The amateur keeps these in a cold cellar, first tying the varieties in separate bundles, carefully labelled and packed in damp sawdust or earth. The nurseryman makes them into bundles containing 100 cuttings each. The lower ends are squared and the bundles packed away in earth in cold cellars, or stored in pits outside, well protected from the action of frost, by heavy coverings of soil and mulch. Some propagators make a point of placing the butt end of the bundle upwards, and only one tier deep. When the ground begins to warm in the spring, protective mulch and soil is taken away, leaving a covering of three or four inches of mellowed earth over the butts of cuttings. As the sun first warms the surface of the ground callousing action is, therefore, incited preparatory to the emission of roots from the cut surface of the cutting sooner than elsewhere which is difficult to propagate. The cuttings are examined occasionally and when roots begin to make their appearance the bundles are taken up and the cuttings transplanted in nursery rows. This is accomplished by means of a spade or dibble. All varieties do not strike with the same readiness. The relative ease with which they strike is dependant mainly upon the species from which they are derived. Those of Labrusca origin propagate readily, with one or two exceptions, as in the case of Moore's Early, which is generally higher priced than other standard sorts on that account. The descendants of *Riparia* and *Aestivalis* strike less freely. In such cases it is wise to resort to layering.

By Layering.—If a low growing cane is bent to the ground in spring and covered with earth it will throw out roots at the "joints"—buds. In the autumn the entire arm may be severed from the parent stock and often, as many rooted plants as there are buds on the cane may be obtained in this way. A sufficient depth of earth should cover the cane, especially at the buds, as will preserve a fairly uniform degree of moisture. The young plants should be set in nursery rows for a year before they are used for permanent planting. The Delaware is often grown from layers, because like Morre's early it is difficult to propagate from cuttings.

By Single Bud.—This is an economical method employed to multiply new or high priced varieties. A single bud or "eye" is used only. The bud is cut with an inch of cane on each side. The "Eyes" are packed in boxes with earth, or moss and stored in a cellar. Towards spring, the boxes are placed in a hot-bed or on a greenhouse bench, to induce callousing. When this takes place and the weather is sufficiently warm they are set in rows out of doors. They may also be grown in the greenhouse bench. They should be placed in a bench of sandy soil, two months before spring opens and will be ready for transplanting into cold frames in May, in this locality, and into nursery row a month later.

By Grafting.—The vine may be grafted by any method used in multiplying other plants. It is often desirable to change the variety of an old, well established plant. This may be done very easily by cleft grafting, the simplest of all methods. The operation in northern countries should be performed in early spring, the best time being at that period when the leaves are starting. The stock is cut off three or four inches below the surface of the ground, split by means of a wedge and mallet, and a scion of two buds in length then inserted. The cleft should be bound with a string and the soil replaced so as to cover the union. This completes the operation. Root grafting is largely practised in France, and is practically the same method as that employed in root grafting the apple (see Report 1895, page 82. In this case whole roots are only used.

THE VINEYARD.

The Site.—The investigating fruit-grower will find in Ontario healthy and paying vineyards, situated upon nearly all classes of soils. The grape is a warmth loving plant and undoubtedly the most favourable location is that which furnishes a loose, well drained clay loam, in addition to a free atmospheric circulation. Good soil drainage is imperative if a long-lived, productive vineyard is the ambition of the fruit-grower. There are examples of the ill effect of imperfect soil drainage to be found in some of the best grape growing sections of Ontario—a yellowing of the foliage—dropping of the fruit —indications are that there is something radically wrong. Occasionally late spring frosts visit us, the injury is most severe as a rule in the lower levels of the vineyard. In Eastern Ontario and Quebec where the summer heat requisite to bring some of our best varieties to maturity is deficient, a warm southern exposure should be selected. If this is protected by wind breaks on the north and west, so much the better.

Preparing the soil.—Hoed crops meaning those requiring cultivation, in summer as roots and potatoes, should precede vines. When the ground is cleared of these, a good plan is to plough it into narrow lands, allowing the dead furrow to fall into the line of each proposed row. Subsoiling is of prime importance and should be done as thoroughly as possible. If the ground is allowed to remain in this condition till spring, the pulverizing action of the frost will have acted beneficially upon the soil, greatly increasing its mellowness and friability.

Time to plant.—In the best grape growing sections, both fall and spring planting is practised, most growers claim, with equal success. The amount of leisure time, therefore, may be allowed to guide the planter, although in fall planting the ameliorating influence of the frost upon the soil previous to planting is lost. Fall set plants should also be protected by throwing a furrow against them on each side. In the east and north, spring is undoubtedly the best season.

Distance apart and how to plant.—Grapes, like apple trees, require room, according to their vigour—Delaware, Moore's Early and Moyer do well 8 x 8 feet apart, or even less. Strong growing varieties, like Concord and Niagara, need more room between the plants in the row and should be 10 feet apart, though as a general rule 8 x 10 feet is the distance used by most planters. At the north, it is important that the vine should be planted deeply, 15 inches to 18 inches being often recommended. To obtain this depth, the vine is planted in a hollow, which is filled gradually subsequent to the growth of the plant. Ten to twelve inches may be accepted as the ordinary depth. It always pays to buy strong plants. They quickly return the price in fruit. Occasionally satisfactory yearlings may be secured, but strong two year olds are much better. As in setting out tree fruits, be careful to remove all bruised portions of roots; the fibres should not be allowed to become dry; the earth should be firmly packed about the roots.

Intermingling varieties in the vineyard.—It has long been a common observation that certain varieties set loose straggling bunches when planted in blocks by themselves. This is the result of imperfect pollination. The experiments of Prof. S. A. Beach, of the New York Experiment Station at Geneva, have given us a list of those varieties, fertile, partially fertile and nearly, or wholly sterile, with their own pollen. It will be noticed that the majority of the self-sterile varities are hybrids—the product of two distinct species.

* The following list is only partial but includes the principal commercial varieties.

I. Grapes fully self-fertile—

Variety.	*Parentage.*	*Variety.*	*Parentage.*
Campbell,	Lab. x Vin.	Poughkeepsie, Red,	Lab.
Deleware,	Vin. x	Rogers' No, 13,	Lab.
Janesville,	Lab. x Vulp.	Rogers' No. 24,	Lab.
Moore's Early,	Lab.	Rogers' No. 32,	Lab.
Niagara,	Lab.	Winchell,	Lab.

* A complete list is given in the Annual Report of the Ontario Fruit Growers' Association, p. 98.

II. Grapes partially self-fertile, but practically capable of fruiting satisfactorily if planted alone :—

Variety.	*Parentage.*	*Variety.*	*Parentage.*
Agawam,	Vin x Lab.	Empire State,	Lab.
Brilliant,	Lab. x Vin.	Jefferson,	Lab.
Catawba,	Lab.	Vergennes,	Lab.
Clinton,	Vulp.	Worden,	Lab.
Concord,	Lab.		

III. Grapes partly self-fertile : set fruit unsatisfactorily when planted alone :—

Variety.	*Parentage.*	*Variety.*	*Parentage.*
Adirondack,	Lab.	Duchess,	Lab.
Amber Queen,	Rip.	Eumelan,	Lab.
Canada,	Rip. x.	Perkins,	Aest.

IV. Grapes which bear abortive fruit, but do not perfect fruit when planted alone :—

Variety.	*Parentage.*	*Variety.*	*Parentage.*
Aminia, (Rogers' No. 39),	Lab.	Merrimac, (Rogers' No. 19),	Lab.
Brighton,	Lab.	Requa, (Rogers No. 28),	Lab.
Essex, (Rogers' No. 41),	Lab.	Rogers' No. 5,	Lab.
Gaertner, (Rogers' No. 44),	Lab.	Salem, (Rogers' No. 53),	Lab.
Massasoit, (Rogers' No. 3),	Lab.	Wilder, (Rogers' No. 4),	Lab.

V. Grapes in which self-pollination has no perceptible influence on the ovary,—

Variety.	*Parentage.*	*Variety.*	*Parentage.*
Amber,	Vin x Lab.	El Dorado,	Lab x Vin.
Barry (Rogers' No. 43),	Lab. x Vin.	Lady,	Lab x Vin.
Creveling,	Vin x Aest.	Lindley, (Rogers' No. 9),	Lab x Vin.
Eaton,	Lab.	Norwood,	Lab.

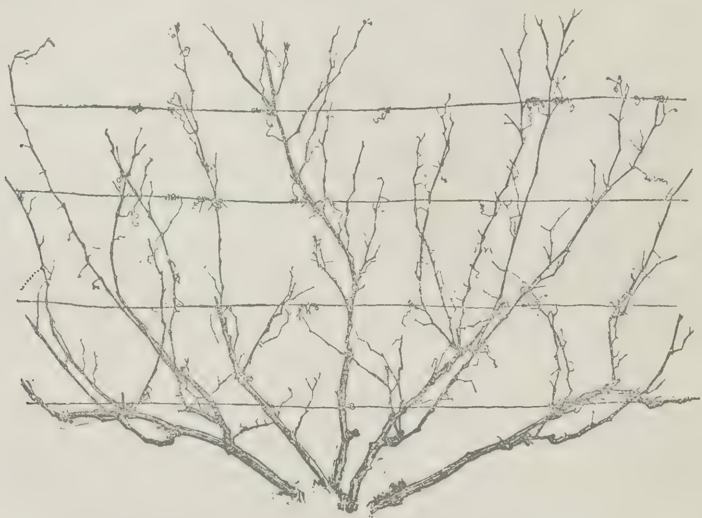
Cultivation.—"Frequent cultivation" should be a motto in growing a vineyard. The surface should be kept mellow by the frequent passage of the cultivator or grape hoe. This latter, is an exceedingly useful implement in the vineyard or small fruit plantation. In a dry season the importance of frequent shallow cultivation, as a means of retaining the moisture of the soil, is not easily over estimated. A good practice is to plough to the vines in the late summer and away from them in the spring. The furrows nearest the trellis should be very shallow, as the surface soil is filled with fibrous roots. The cultivator and grape hoe will do the work during the remainder of the season. A cover crop is of great service in the north, to catch the snow, and thus afford protection to the roots of the vines. Crimson clover does not, as a rule, make sufficient growth to afford much protection when sown as late in the season as seems desirable. Probably rye or field pease will serve the purpose and will also give some return when ploughed under. Grape growers in this vicinity make special arrangements in the way of providing movable "snow catchers" for the more exposed parts of their vineyards. This is very important when the vines are young.

Fertilizers.—Heavy fertilizing with barnyard manures will, in most cases, induce an over luxuriant growth with a tendency to mildew of foliage and fruit. A dressing of barnyard manure once in three years will probably give sufficient nitrogen. The phosphoric acid and potash (both of which are largely drawn upon by the grape vine) should be supplied the two remaining years. Wood ashes or muriate of potash, and superphosphate or bone meal will supply these.

Training and Pruning.—To carry out any system of pruning properly, and there are many, one should understand the underlying principles, and these are the same throughout.

The vine produces its fruit near the base of the growing shoots that spring from the wood of last season's growth. These shoots go on growing after producing two or three clusters of fruit; a bud is formed every six or eight inches. If the cane makes a growth of eight or ten feet it would mean a dozen or more such buds. Then if this cane were not cut back each bud would throw out a shoot the following spring, which would bear two or three bunches of fruit. As each vine would carry ten or fifteen such canes it is easily seen that the crop of fruit would be greater than the vine could properly develop and mature. Pruning, is therefore, practised as a means of thinning the crop and keeping the vines within bounds and under control.

In Quebec and Eastern Ontario, where vines need winter protection, and are carried through the winter by laying them down and covering them with earth, two systems of training are practicable only. Whatever system, the cane may be cut back, to two eyes at the close of the first year's growth in the vineyard.



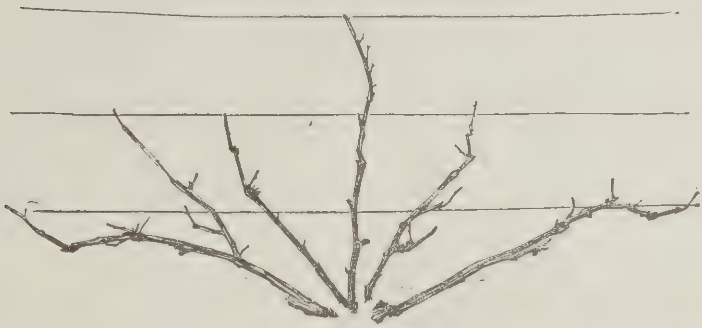
Fan system before pruning. (From a photograph.)

Fan System.—This is used most freely where vines are protected in the autumn by laying them down and covering them with soil. The canes are carried up from the ground in a divergent manner, in the form of a fan. The old canes are cut out and removed from time to time as they grow too rigid to allow of easy bending. At the close of the growing season after the leaves have fallen, the greater number of the canes are cut back to the last bud. A few of the strongest are left, in order to carry the fruit to a greater height upon the trellis.

There is a tendency on the part of the grower to allow too much wood to remain on the plant in the autumn, especially when it is young. The vine should not be allowed to bear the second year after setting out, and only a small crop the third year. I quite realize that instructions of this kind are much easier given than understood and carried out. A heavy crop of fruit borne by young vines the third year after planting will sometimes ruin the yield for two or three succeeding years, and often destroy the vines. The prospective crop may be more or less accurately estimated by multiplying the number of buds by two, this kind of estimate may be used as a guide in pruning. The fan system aims, at starting the canes near the ground, giving the vine practically several main stems.

High Renewal.—This system, or modifications of it, are probably more generally adopted throughout Ontario than any other. It aims at starting the head about two feet from the ground, so that the main branches are tied to the lower wire. The vine is usually started the second year with two canes striking out in Y-shaped fashion. In the fall of the same year all side shoots are cut back closely and the main canes cut back

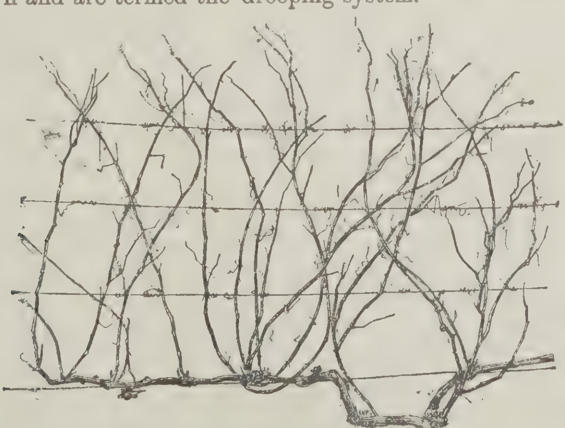
to four or five buds each. The third season three or four of the strongest shoots springing from the centre of the head are allowed to grow. In the autumn these replace the outer arms, and are in turn replaced by them the following season. The aim is, then to renew the fruiting canes from different parts of the old wood every year. The number of buds to be left will depend upon the strength of the variety and the individual plant.



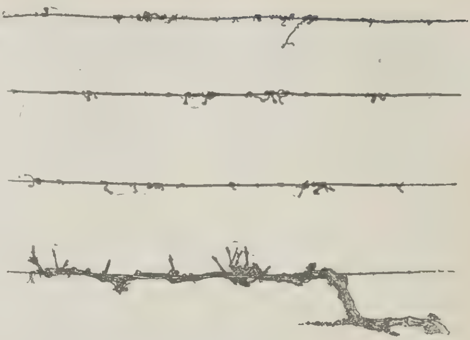
Fan system, pruned. (From a photograph.)

Concord, Niagara and Worden will carry with safety more wood than Moore's Early or Delaware. As the canes grow they are tied to the wires of the trellis, distributing the foliage as much as possible. It is usually found necessary to go over the vineyard two, three and, occasionally four times, during the summer, in order to properly secure rapidly growing wood, so that the bunches are held clear of the ground. When the head becomes weak, as it may, after a few years, it is necessary to train up a new shoot from the ground.

Horizontal System.—This method of training is especially adapted to sections of the country where it is advisable to give the vines winter protection. Two strong canes are trained in opposite directions. The laterals springing from these are trained perpendicularly. In the autumn the laterals are cut back to two spurs. When the spurs become weak they are renewed, as is an entire arm occasionally. This system calls for a four-wired trellis, in order to properly tie the strong laterals. The three methods of training described thus far, are all on the upright plan; in those which follow, the vines hang down and are termed the drooping system.



Horizontal system, before pruning. (From a photograph).



Horizontal system pruned. (From a photograph).

Four Cane Kniffen.—In this system the trellis consists of two wires. The main cane is carried to the top wire and from it an arm is trained each way on the two wires. The side canes are tied to the wires and the lower ends allowed to hang free. The advantage of this system over others is that it obviates a large amount of tying and perhaps lessens the amount of summer pruning. This Kniffen system is largely used in the Hudson River Valley, N.Y., where it originated. It has been strongly recommended and is in favour for strong growing varieties. In pruning a full grown vine, the upper arms are usually allowed to carry a greater number of buds than the lower. Thus, many allow ten buds to the upper, and five buds to the lower canes. The arms should be stretched along and attached firmly to their respective wires; from these the laterals droop. When the arms become weak they are renewed from the head.

Modifications of this system are found—one umbrella-like, falls from a single high wire only, others carry six or eight canes, but all are drooping.

Over-head or Arbour-Kniffen.—This method of training is practised by a few prominent fruit growers in Ontario. The vines are carried up seven foot posts and allowed to rest on cross wires, forming in this way a kind of arbour. One plan is to nail a cross piece to each post at right angles to the pole. This extends three feet on each side. Three wires are stretched on these, one at each end, the other in the middle to the posts. The trellis is thus a horizontal one and six feet above the ground. An unbranched trunk is carried up to the middle wire and the canes spread either side from this point. A T-shaped head is considered the ideal form. Another over-head system is known as the "Cross Wire Kniffen." In this a small post six or seven feet high is set for each vine. The tops of the posts are connected by cross wires. The vines are trained up the posts, and on reaching the top four arms are trained outwards, one on each wire. In the autumn the arms are cut back to six or eight buds each. In the case of the over-head systems, movable platforms may be used in harvesting the fruit.

Post Training.—This has been used at Ottawa in order to compare it with trellised vines. It has not given satisfactory results. When the foliage is crowded on a small post the fruit colours slowly and unevenly, and mildew and rot are encouraged.

Summer Pruning.—It is always desirable to remove the shoots that spring from or near the base of the vine, except when they are required for a special end. These shoots are quickly broken out, or nipped off when still soft and succulent. A certain amount of shortening back is also desirable. This should not be done too early in the season. In summer pruning of Lindley, for instance, I have found it best to shorten back after the first strong growth has taken place. If pinched early in the growing season a great mass of laterals is produced and the amount of work very much augmented.

The Trellis.—It is well to set the posts the year following the planting of the vineyard. If trained on the upright system, the posts should stand five feet to six feet above ground, and be not less than six feet high if the over-head system is adopted. Cedar or oak are preferred on account of durability. The end posts of each row should be thoroughly and efficiently braced, either with a brace on the inside, or on the outside, with a strong wire running from the top of the post to a stone firmly embedded in the ground. No. 12, plain annealed wire is ordinarily used and is fastened to the posts by wire staples. The posts are usually set far enough apart—in the upright systems—to allow of two vines being planted between each two posts. The wires should be run through the end post and be attached to and wound around a piece of wood, which will act as a spool, to enable the growers to tighten them in the spring and to loosen them

in the autumn, thus allowing for contraction. Raffia—the product of a palm-like plant—wool twine and osier willows are used in trying the canes to the trellis. The first named, is a cheap and very satisfactory material for the purpose.

CARE OF THE FRUIT.

Thinning.—Reference has already been made to the desirability of pruning with a view to restricting the quantity of fruit and of providing for its even and irregular distribution upon the vine. The size of the bunches may be materially enlarged by a judicious removal of the smaller clusters. The size of the berries may also be increased by thinning the berries on each bunch where they are closely set. The average grower cannot afford the time required to do the latter, except, perhaps, in the case of exhibition samples—nor do all varieties call for this treatment. In this age of keen competition it will, I believe, pay growers to remove a portion of the smaller bunches when "tying" and "suckering." The effect will be seen in the improved size and appearance of the remaining product. "Ringing" canes, which produces large clusters and berries, at the expense of quality, should be discouraged.

Spraying.—This is not always needed. If properly done, it is always effective. Downy mildew attacking leaves and fruit, may be prevented by using Bordeaux mixture. Make the first application as the buds are bursting, the second, just after the fruit has set, and the third, two weeks later. If later applications are needed, Ammoniacal Copper Carbonate should be used. Powdery mildew also yields to Bordeaux mixture. "Anthracnose" or "Bird's Eye rot," is one of the most serious troubles affecting grapes in Eastern Ontario and the province of Quebec. It is kept in check only when the utmost care and vigilance is exercised.

1.—Spray the canes when uncovered and still dormant, with Copper Sulphate, 1 pound to 25 gallons of water.

2.—Follow this with Bordeaux mixture, as directed above.

3.—Remove and destroy diseased foliage and fruit as soon as it makes its appearance.

4.—Fertilize with wood ashes and bone meal, supplemented with light dressings of well rotted barn-yard manure.

Picking and Packing.—Growers almost invariably pick into the baskets that are shipped to market. Thin skinned grapes of fine quality, like Delaware and Brighton, should always be packed in small baskets. A ten-pound "veneer" basket is a favourite in the Niagara district. A basket rack, holding two baskets, is a convenient device to use in the vineyard. The bunches may be cut with a sharp knife or pruning shears, as preferred. They should be cut off close to the cane and placed stem end down in the basket, laying the bunches regularly till the receptacle is filled. The filled baskets are taken to the packing house, weighed, the finishing touches put on, in the way of facing, etc., and then covered. A leno cover of suitable colour attached to a veneer frame, when fastened down, completes the package, the name of the variety being stamped upon the end or top. The bunches should always be handled gently to prevent bruising and cracking. Concord and Worden are usually shipped in 20-pound baskets. Good keepers like Vergennes and Catawba, are sold, advantageously in winter in 5-pound packages.

The following table contains information relative to the characteristics and yield of 167 (?) varieties grown in the vineyard at the Central Farm. The yields given are somewhat under the actual returns as no account has been rendered of the bunches taken for exhibition samples each year. This sometimes amounted to four or five pounds. All varieties were treated as nearly as possible alike in this respect, still, the more productive varieties were naturally drawn upon more freely than the weaker growers and lighter bearers.

CHARACTERISTICS and Yield of different Varieties of Grapes

Name.	When Planted.	Place of Origin.	Parentage.	Vigour, 1 to 10.	Freedom from Disease, 1 to 10.	Date of Blooming.
						1895.
Ariadne	1888	Newburgh, N.Y	Rip. × Vin.	8	8	June 14
Antoinette	1888	New Jersey	Labr.	......	......	do 21
Amber Queen	1888	Norwood, Mass	Labr. hybr.	8	7	do 19
Alma	1888	Newburgh, N.Y	Rip	8	7	do 21
Alvey	1888	Hagerstown, Md	Æst. hybr	8	8	do 22.
August Giant	1888	Norwood, Mass	Rip. hybr	9	7	do 20
Abyssinia	1888	Hamilton, Ont	Rip	8	8	do 21
Autuchon	1888	Paris, Ont	Rip. hybr.	7	8	do 21
Alexander Winter	1891	Bellefontaine, Ohio	Labr.	8	7	do 20
Aminia, (Rogers' No. 19)	1888	Salem, Mass	Labr. hybr.	8	8	do 21
Agawam. (Rogers' No. 15)	1888	do	do	9	7	do 19
Amber	1888	Bluffton, Mo.	Rip. × Labr.	8	7	do 18
Allen's Hybrid	1888	Salem, Mass	Labr. × Vin.	7	6	do 21
Brant	1888	Paris, Ont	Rip. hybr.	8	6	do 20
Barry, (Rogers' No. 43)	1888	Salem, Mass	Labr. hybr.	9	8	do 20
Beta	......	London, Ont	Vin. hybr	.....	..	do 15
Belvidere	1888	Belvidere, Ill.	Labr.	7	8	do 21
Black Elvira	1888	Morrison, Mo.	Rip. hybr	9	8	do 20
Burnet	1888	Albury, Ont	Labr. hybr.	8	7	do 22
Bacchus	1888	Newburgh, N.Y	Rip	9	8	do 12
Beauty	1888	Morrison, Mo.	Æst. hybr	8	6	do 20
Brighton	1888	Brighton, N.Y	Labr. × Vin.	9	7	do 21
Berckman's	1888	Chester, S.C	Rip. hybr.	9	8	do 15
Brilliant	1891	Denison, Tex.	Labr. hybr.	7	8	do 19
Berlin	1894	Ionia, Mich.	Labr.	8	8	....
Clinton	1888	New York	Rip	10	10	June 13
Cynthiana	1888	Arkansas	Æst	8	......	....
Canada	1888	Paris, Ont	Rip. hybr.	9	8	June 18
Creveling	1888	Pennsylvania	Labr. hybr.	8	5	do 17
Cottage	1888	Concord, Mass	Labr.	8	8	do 19
Critic	1894	North Carolina	do	7	.....	....
Concord	1888	Concord, Mass	do	9	8	June 19
Cornucopia	1888	Paris, Ont	Rip. hybr.	8	7	do 19
Cambridge	1888	Cambridge, Mass	Labr.	9	8	do 21
Challenge	1888	New Jersey	Labr. hybr.	8	7	do 12
Conqueror	1888	do	do	8	8	do 14
Champion	1888	New York ?	Labr.	9	8	do 17
Canterbury	1888	....	do	8	7	do 20
Clevener	1888	New Jersey	Rip	9	8	do 12
Cunningham	1888	Virginia	Æst	7	8	do 17
Catawba	1888	North Carolina	Labr.	9	7	do 21
Chase Bros	1888	Brighton, N.Y	do	8	8	do 21
Campbell, G. W. (Early Golden)	1891	Denison, Tex.	Labr. hybr.	7	7	do 22
Delaware	1888	New Jersey	Vin. hybr ?	8	9	do 21
Dracut Amber	1888	Dracut, Mass.	Labr.	9	8	do 18
Don Joan	1888	Newburgh, N.Y	Labr. hybr.	7	6	do 22
Diana	1888	Milton, Mass.,	Labr.	8	6	do 20
Duchess	1888	Newburgh, N.Y	do	8	6	do 27
Early Victor	1888	Kansas	do	7	6	do 17
Essex, (Rogers' No. 41)	1888	Salem, Mass	Labr. hybr.	7	8	do 20
Eaton	1888	Concord, Mass	Labr.	7	8	do 19
Eumelen	1888	Fishkill, N.Y	Æst	8	7	do 23
Elsinburg	1888	New Jersey	do	7	7	do 25
Eva	1888	Bluffton, Mo.	Labr.	8	6	do 21
Etta	1888	Morrison, Mo.	Rip	9	7	do 17
Eldorado	1 888	Newburgh, N.Y	Labr.	8	7	do 20

grown in the Vineyard at the Central Farm.

Date of Ripening.	Colour.	Average yield per Vine. Number of years.	Lbs.	Ozs.	Useful for Wine or Dessert.	Remarks.
1895.						
Oct. 12..	Black..............	2	2	12	Wine............	Valueless in Eastern Canada.
Sept. 16..	White..............	....	....	....	....	A seedling of Concord.
Oct. 3..	Reddish purple......	4	14	9	Table	Differs in colour from that grown by others in this vicinity.
do 2..	Black..............	4	4	0	Wine...........	Does not seem to be valuable.
do 3..	do	2	2	2	do	Not suited to this locality.
do 6..	Reddish black......	4	11	6	do	Though vigorous, occasionally winter kills.
Sept. 29..	Black..............	4	8	6	do	Hardy.
Oct. 2..	White..............	4	2	3	do	Does not appear to be valuable.
do 1..	Dark amber.........	2	1	0	Table..........	Proves tender in this locality.
Sept. 20..	Dark purple........	4	2	8	do	One of the most valuable of the Rogers.
Oct. 8..	Dark red...........	4	9	3	do	Needs spraying.
Sept. 29..	Pale amber.........	4	3	1	do	Too late in this locality.
do 20..	Golden white.......	4	6	4	do	Good quality.
Oct. 5..	Black..............	4	5	0	Both........	Much affected by anthracnose.
Sept. 22..	do	4	8	0	Table	Ripens evenly; keeps well.
do 27..	do	1	3	8		
do 16..	do	4	4	13	do	Neither large nor attractive.
Oct. 3..	Blue black.........	4	18	11	Wine...........	Rather late for this locality.
Sept. 29..	Purplish black.....	4	5	9	Table..........	Keeps fairly well.
Oct. 5..	Black..............	4	8	6	Wine...........	A good wine grape at the north.
do 9..	Bright red.........	3	7	0	Table..........	Later than Concord.
Sept. 23..	Bright amber.......	4	3	1	do	Of fine quality, but perishable.
Oct. 3..	Pale red...........	4	6	0	do	Larger than Delaware; not equal in quality
Sept. 25..	Deep garnet........	2	2	2	do	Of fine quality, but not productive.
do 25..	White..............	1	0	4	do	
Oct. 4..	Black..............	4	8	0	Wine...........	Uncertain in ripening at Ottawa.
....	do	....	....	....	do	Vines killed out.
Oct. 5..	do	4	3	10	do	Appreciated as a dessert grape by some.
do 10..	Blue black.........	4	7	9	Table	Suffers severely from anthracnose.
Sept. 25..	Purplish black.....	4	9	10	do	Shells badly.
....	Red................	....	....	....	do	Description taken from Bushberg's catalogue.
Oct. 2..	Black..............	4	18	8	Black..........	Reliable, but late.
Sept. 28..	do	4	4	9	Table..........	Usually too late.
Oct. 1..	do	4	4	11	do	Resembles Concord closely.
do 15..	Pale red...........	2	3	2	do	Sets and ripens unevenly.
Sept. 27..	Black..............	4	2	0	do	Pulp tough.
do 10..	do	4	15	13	?	Productive, but of poor quality.
Oct. 15..	do	3	17	6	Table..........	Not valuable.
Sept. 27..	do	4	8	1	Wine...........	Resembles Clinton.
do 29..	do	3	8	0	do	
Oct. 15..	Dark red...........	3	6	0	Table and wine..	An old standard variety.
Sept. 14..	do	4	4	4	do	An unintroduced variety.
do 23..	Yellowish white.....	1	1	8	do	Not promising.
do 16..	Light red..........	4	8	10	Dessert........	Does well on gravelly soils when sufficiently fertilized.
do 14..	Pale red...........	4	17	0	do	Shrivels and drops badly.
Oct. 10..	Dark amber.........	4	2	12	Table......	Much affected by anthracnose.
do 15..	Lilac pink.........	4	6	0	Wine and table..	Too late.
do 3..	White..............	4	8	4	Table..........	Quality good; berries spot badly.
Sept. 16..	Black..............	4	10	4	Both...........	Berry shrivels soon after ripening.
Oct. 5..	do	4	9	8	Dessert........	Has not been productive.
Sept. 27..	Blue black.........	3	7	0	Table..........	Has not proved productive.
Oct. 1..	Black..............	4	15	8	do and wine..	Of rich vinous flavour.
do 15..	do	4	3	0	Wine...........	Small and worthless.
Sept. 16..	White..............	4	4	4	do	Too late in this locality.
Oct. 5..	do	4	17	10	do	do do
Sept. 16..	do	3	2	0	Table..........	Fine quality; sets badly.

CHARACTERISTICS and Yield of different Varieties of Grapes

Name.	When Planted.	Place of Origin.	Parentage.	Vigour, 1 to 10.	Freedom from Disease, 1 to 10.	Date of Blooming.
						1895.
Excelsior	1888	Newburgh, N.Y	Labr. hybr.	9	7	June 20
Elvira	1888	Morrison, Mo.	Rip. hybr	9	8	do 18
Eclipse	1891	Leavenworth, Ks.	Labr.	7	8	do 23
Empire State	1888	Newburgh, N.Y	Labr. × Rip.	7	8	do 21
Early Ohio	1894	Euclid, Ohio	Labr. hybr.	7	8	......
Florence	1888	......	Labr.	7	9	June 20
Farrell	1891	Leavenworth, Ks.	do	8	8	do 24
Faith	1888	Morrison, Mo.	Rip	8	6	do 18
Gartner (Roger's No. 14)	1888	Salem, Mass	Labr. hyb.	9	7	June 21
Grein's Golden	1888	Hermann, Mo.	Rip. hyb.	8	6	do 18
Grein's No. 4	1888	do	do	9	7	do 17
do 7	1888	do	do	8	7	do 19
Golden Gem	1888	Newburgh, N.Y	Æst. hyb.	7	7	do 20
Golden Drop	1888	......	Labr. hyb.	7	7	do 18
Herbert (Roger's No. 44)	1888	Salem, Mass	do	9	8	do 18
Hartford Prolific	1888	Hartford, Conn.	Labr.	9	9	do 17
Hosford	1894	Ionia, Mich	do	7	......	......
Hermann Jaeger	1891	Denison, Tex.	Æst. × Linc.	9	8	June 21
Highland	1888	Newburgh, N.Y	Labr. hyb.	7	7	do 22
Hofer No. 2	1891	McGregor, Iowa	Labr.	7	9	do 22
Hayes	1888	Concord, Mass	do	9	8	do 22
Imperial	1888	Newburg, N.Y.	do	8	6	......
Isabella	1888	South Carolina	do	9	7	June 18
Israella	1888	New York	do	8	7	do 21
Ideal	1891	Leavenworth, Kan.	Æst. ×	7	8	do 18
Iona	1888	Iona Island, N.Y.	Labr.	8	7	do 22
Ives	1888	Cincinnati, O.	do	8	7	......
Irving	1888	Croton Point, N.Y.	do hyb.	8	7	June 17
Jewel	1891	Leavenworth, Kan.	Æst.	8	8	do 22
Janesville	1888	Wis.	Labr.	8	8	do 15
Jefferson	1888	Newburgh, N.Y	do	8	7	do 18
Jessica	1888	St. Catharines, Ont.	Vin. hyb.	8	7	do 20
Kensington	1888	London, Ont	do	8	8	do 18
Leavenworth	1891	Leavenworth, Kan.	Labr. hyb.	8	8	do 21
Lindley (Rogers' No. 9)	1888	Salem, Mass	do	9	7	do 19
Lady Washington	1888	Newburgh, N.Y	Labr.	8	8	do 20
Lady	1888	Ohio	do	7	8	do 21
Merrimac (Rogers' No. 19)	1888	Massachusetts	Labr. hyb.	9	8	do 21
Moores' Early	1888	Concord, Mass	Labr.	7	9	do 21
Marion	1888	Pennsylvania	Rip	9	7	do 14
Monroe	1888	Rochester, N.Y	Laby. hyb	7	8	do 21
Mills	1891	Hamilton, Ont	Vin. hyb.	8	7	do 22
Montefiore	1888	Morrison, Mo	Rip. hyb.	8	6	do 19
Maxatawney	1888	Pennsylvania	Labr.	9	8	do 20
Mary	1888	Griffin, Ga	do hyb.	9	7	do 19
Moyer	1888	Lincoln County, Ont.	Æst. hyb	7	8	do 20
Massasoit (Rogers No. 3)	1888	Salem, Mass	Labr. hyb.	8	7	do 20
Martha	1888	Lebanon, Penn.	Labr.	8	8	do 19
Missouri Reisling	1888	Hermann, Mo.	Rip. hyb.	9	6	do 13
Moore's Diamond	1888	Brighton, N.Y	Lab	8	8	do 22
Mason's Seedling	1888	Mascoutah, Ill.	do	7	7	do 22
Norton	1888	Richmond, Va	Æst.	9	8	do 25
Naomi	1888	Newburgh, N.Y	Rip.	8	8	do 21
Norfolk Muscat	1888	Norwood, Mass.	Laby. hyb.	7	7	do 21
Northern Muscadine	1888	New Lebanon, N.Y.	do	9	7	do 17

grown in the Vineyard at the Central Farm—*Continued.*

Date of Ripening.	Colour.	Average yield per vine. Number of years.	Lbs.	Ozs.	Useful for Wine or Dessert.	Remarks.
1895.						
Oct. 12..	Pinkish red.........	3	3	13	Table..........	Ripens too late.
do 1..	White........	4	4	0	Wine...........	A thin-skinned wine grape.
Sept. 28..	Green....	4	2	0	Table	Later than Concord.
Oct. 1..	White...............	2	3	13	do	Has not been productive.
....	Black	....	....		do	Vines killed by frost after bearing one crop.
Sept. 6..	do	4	7	10	do	Valuable only on account of earliness.
Oct. 9..	White..............	4	2	8	do	Vine somewhat tender.
Sept. 16..	do	4	5	0	do	Berries small; worthless here.
do 25..	Bright red...........	4	5	13	do	Good quality.
do 18..	Golden yellow.......	4	14	10	do	Too tender for a market variety.
Oct. 1..	Greenish white......	4	7	3	Wine	Thin skinned and tender.
Sept. 25..	White..	4	11	..	Table.	A thin skinned, tender fleshed variety.
do 14..	Golden yellow.......	3	2	9	do	Valuable only to the amateur.
do 10..	Yellowish white.....	4	2	11	do	do do
do 27..	Black...............	4	18	2	do	A reliable Rogers' variety.
do 16..	do	4	9	12	do	Productive, vigorous, poor quality.
....	....	....	....		....	Not fruited.
Oct. 10..	Purplish black.......	2	1	..	Table.	Ripens imperfectly.
do 9..	Black....	4	10	..	do	Too late in this locality.
Sept. 16..	do	3	1	10	do	Concord type.
do 12..	White...............	4	2	9	do	Does well on sandy loam.
....	Pinkish white.......	....	....		do	Perishable.
Oct. 8..	Dark purple.........	4	13	2	Table and wine.	Does not ripen perfectly here.
do 10..	Black...............	4	10	..	Wine..	do do
Sept. 19..	Amber.	4	1	9	Table...........	Vine seems to lack vigour.
Oct. 9..	Bright amber.......	4	7	13	do	Too late.
....	Purplish black.......	....	....		Wine	Vines proved tender.
Sept. 19..	Yellowish white.....	4	6	5	Table.	Too late.
do 8..	Black....	2	1	4	do	Seems to be an improvement on Janesville.
do 20..	do	4	5	..	do	Slightly better in quality than Champion.
do 18..	Light red...........	4	11	3	do	Keeps well.
do 19..	White............	4	10	..	do	Rather late.
do 27..	do	4	11	11	do	Valuable amateur variety.
Oct. 1..	Black....	3	3	4	do	This may not be true to name.
Sept. 16..	Red	4	8	12	do	Is badly attacked here by anthracnose.
Oct. 5..	White.....	4	1	6	do	Inclined to drop from bunch.
Sept. 12..	do	4	4	9	do	Valuable on account of earliness.
do 9..	Black	4	9	10	do	Should be planted with other varieties.
do 12..	do	4	3	6	do	Needs good cultivation.
Oct. 1..	do	4	10	13	Wine..	Bears heavily.
Sept. 20..	do	4	7	12	Table.	Ripens early, but poor in quality.
Oct. 15..	do	2	2	..	do	Fine quality. European type.
Sept. 25..	Blue black..........	4	5	12	Wine..	Ripens unevenly.
do 16..	Light amber..	4	5	12	Table...........	Berries mildew somewhat and drop badly.
do 29..	Bright red..........	4	11	..	do	Very much like Lindley.
do 10..	do	4	4	12	do	Valuable on account of earliness only.
do 29..	Dark red............	4	15	..	do	Needs spraying.
do 16..	White.............	4	8	..	do	Fairly early and productive.
do 30..	Greenish white......	4	14	3	Wine	Too late in this locality.
do 29..	do ...	4	5	3	Table...........	Rather tender for distant shipment.
do 27..	White.	4	3	5	do	Does not seem valuable.
Oct. 8..	Black....	4	4	12	Wine..	Ripens fairly well.
do 5..	do	4	8	13	do	Too small.
Sept. 29..	Lilac.....	4	2	9	Table...........	Holds to the bunch fairly well.
do 29..	Dark amber	4	9	3	Wine	Drops from bunch badly.

CHARACTERISTICS and Yield of different Varieties of Grapes

Name.	When Planted.	Place of Origin.	Parentage.	Vigour, 1 to 5.	Freedom from Disease, 1 to 5.	Date of Blooming.
						1895.
Noah	1888	Nauvoo, Ill.	Rip.	9	2	do 14..
Niagara	1888	Lockport, N.Y.	Labr.	9	8	do 20..
Northern Light	1891	L'Original, Que.	do	7	8	do 21..
Norwood	1888	Norwood, Mass.	do hyb.	8	7	do 17..
Othello (Arnold's Hybrid No. 1)	1888	Paris, Ont.	Rip. hyb.	9	7	do 19..
Oriental	1888	Norwood, Mass.	Labr. hyb.	9	6	do 21..
Owosso	1888	Michigan	Labr.	9	7	do 20..
Ozark	1891	Leavenworth, Kans.	Æst.	7	8	....
Oneida	1888	Oneida County, N.Y.	Labr. hyb.	6	7	June 21..
Pizzaro	1888	Newburgh, N.Y.	Rip. hyb.	8	7	do 19..
Pattison	....	....	....	.....	.....	do 12..
Peabody	1888	Newburgh, N.Y.	Rip.	8	6	do 20..
Potter	1888	Rhode Island	Labr.	9	8	do 18..
Paragon	1891	Leavenworth, Kan.	Labr. hyb.	8	8	do 22..
Perkins	1888	Mass.	Labr.	7	7	do 19..
Poughkeepsie	1888	Poughkeepsie, N.Y.	Labr. hyb.	8	8	do 22..
Prentiss	1890	Puetney, N.Y.	Labr.	8	5	do 18..
Pearl	1888	Morrison, Mo.	Rip.	9	4	do 14..
Pocklington	1888	Sandy Hill, N.Y.	Labr.	7	8	do 19..
Rogers No. 17	1888	Salem, Mass.	do hyb.	8	8	do 17..
do 2	1888	do	do	8	7	do 20..
do 33	1888	do	do	8	7	do 20..
do 36	1888	do	do	8	8	do 18..
do 5	1888	do	do	7	7	do 18..
do 13	1888	do	do	7	7	do 21..
Rogers' No. 24	1888	Salem, Mass.	Labr. hybr.	7	7	June 15..
do 30	1888	do	do	8	7	do 21..
do 32	1888	do	do	8	7	do 21..
do 34	1888	do	do	8	6	do 18..
Requa (Rogers' No. 28)	1888	do	do	7	6	do 17..
Rebecca	1888	Hudson, N.Y.	Labr.	6	7	do 17..
Rommel	1891	Denison, Texas	Rip. hybr.	8	7	do 20..
Secretary	1888	Newburgh, N.Y.	do.	7	7	do 21..
Senasqua	1888	Croton Point, N.Y.	Labr. hybr.	7	8	do 22..
Saunders' No. 8	1888	London, Ont.	Rip. × Vin	8	7	do 13..
do 11	1888	do	....	8	7	do 23..
do 51	1888	do	....	7	8	do 22..
do 75	1888	do	....	8	7	do 20..
do 84	1888	do	Rip. × Vin	8	8	do 19..
do 85	1888	do	....	8	8	do 21..
Standard	1891	Leavenworth, Ks.	Labr.	8	8	do 22..
Salem (Rogers' No. 53)	1888	Salem, Mass.	Labr. hybr.	9	7	do 19..
Stayman's No. 19	1888	Leavenworth, Ks.	Labr.	7	8	do 13..
Telegraph	1888	West Chester, Penn.	do	8	8	do 18..
Taylor	1888	Jerico, Kentucky	Rip. hybr.	8	6	do 15..
Transparent	1888	Morrison, Mo.	Rip.	9	7	do 14..
Triumph	1888	Ohio	Labr. hybr.	8	6	do 21..
Ulster Prolific	1888	Marlboro', N.Y.	Labr.	7	8	do 18..
Victoria	1888	Clinton, Ky.	do	7	7	....
Vergennes	1888	Vergennes, Vt.	do	9	7	June 20..
Worden	1888	Minetto, N.Y.	do	8	9	do 19..
Wilder (Rogers' No. 4)	1888	Salem, Mass.	Labr. hybr.	8	8	do 20..
Woodruff	1888	Ann Arbor, Mich.	Labr.	7	7	do 20..
White Ann Arbor	1888	do	do	6	8	do 22..
Winchell	1888	Vermont	do	8	8	do 23..
White Imperial	1888	Kansas	do	9	7	do 22..
White Beauty	1888	do	do	8	7	do 21..
Wilding	1888	Morrison, Mo.	Rip. × Labr.	8	7	do 20..

grown in the Vineyard at the Central Farm—*Concluded.*

Date of Ripening.	Colour.	Average Yield per Vine. Number of years.	Lbs.	Ozs.	Useful for Wine or Dessert.	Remarks.
1895.						
Sept. 30..	Green	4	16	3	Wine	Ripens late and mildews badly.
Oct. 1..	Pale yellow	4	14	1	Table	Like Concord, very productive.
Sept. 19..	White	1	..	12	do	Introduced by P. E. Bucke, of Ottawa, Ont.
do 28..	Bright amber	4	9	10	do	Resembles Lindley.
Oct. 12..	Black	4	9	..	do	Rather late.
do 8..	Bright amber	4	14	..	do	Late ripening variety.
do 3..	Dark amber	4	8	11	do	Apt to mildew.
....	Blue black	...	...	....	do	Poor quality.
Sept. 29..	Black	2	1	8	do	Fruit keeps well ; poor bearer.
Oct. 3..	do	4	2	..	Wine	Too late in this locality.
Sept. 10..	do	4	2	12	....	
Oct. 1..	do	4	5	..	Table and wine.	Excellent quality.
Sept. 24..	do	4	10	8	Table	Berries drop badly.
do 30..	do	3	2	..	do	Not equal to Concord.
Oct. 1..	White	3	10	3	do	Berries drop badly.
Sept. 18..	Clear red	4	5	4	do	Larger in bunch than Delaware.
do 23..	Greenish white	4	6	4	do	Mildews badly.
Oct. 15..	Pale yellow	3	11	12	Wine	Ripens late, mildews badly.
do 5..	Yellowish green	4	1	6	Table	A weak grower, and rather late for this locality.
do 25..	Blue black	4	16	5	do	Closely resembles Merrimac.
do 29..	Purplish black	4	17	..	do	Too late.
do 26..	Black	4	8	8	do	Bears regularly.
do 25..	Blue black	4	15	8	do	Ripens evenly.
do 30..	Red	4	10	4	do	Resembles Lindley.
do 29..	Dark amber	4	7	12	do	Good keeper.
Sept. 23..	Amber	4	10	..	Table	Blossoms imperfect.
Oct. 4..	Light red	3	12	6	do	Sets unevenly.
do 5..	Dark red	4	23	10	do	Rather late.
Sept. 18..	White	3	6	8	do	Blossom imperfect ; sets badly.
Sept. 26..	Brownish red	4	4	6	do	Good quality but unreliable.
do 14..	Pale green	4	3	14	do	Lacks vigour.
Oct. 1..	Greenish white	4	1	8	do	Not productive.
do 5..	Black	4	5	4	do	A fine table grape of European type.
do 8..	do	4	9	9	do	Bunch very large.
do 4..	do	4	4	..	Wine	Hardly promising.
Sept. 18..	do	3	1	10	Table	Resembles Worden.
do 20..	do	4	5	8	Wine	Berry shrivels quickly after ripening.
do 20..	do	2	1	14	do	Rather late.
Oct. 1..	do	3	4	5	do	Vigorous and hardy.
do 9..	do	4	6	7	do	Rather small.
Sept. 23..	do	3	1	10	Table	Early and promising.
Oct. 1..	Dark amber	4	8	4	do	A valuable winter variety.
Sept. 18..	....	1	1	1	do	Weak grower.
do 12..	Black	4	11	3	do	Requires good cultivation.
Oct. 5..	White	3	6	2	Wine	Mildews and ripens late.
do 5..	do	4	6	10	do	do do
do 15..	do	1	12	0	Table	Highly prized in Missouri and Georgia.
Sept. 25..	Light red	4	4	0	do	Not sufficiently vigorous.
....	Light amber	...	..	..	do	Not hardy.
Sept. 29..	Bright red	4	13	3	do	A fine keeper.
do 23..	Black	4	8	6	do and wine.	A standard variety.
do 29..	Purplish black	4	8	7	do	Does not ripen evenly on light soil.
do 29..	Bright red	3	2	8	do	Quite foxy.
do 16..	White	1	8	..	do	Has been quite unproductive.
do 20..	do	2	2	12	do	Berries somewhat tender.
Oct. 3..	do	4	3	10	do	Is fairly promising.
Sept. 18..	do	4	3	0	do	Later than last.
Oct. 1..	Pale green	4	8	3	do	Strictly an amateur variety.

VARIETIES.

With increased production and consequent lowering of prices will come a demand for better quality. It is probable that Concord, Niagara and Delaware will continue to lead in popularity for some time. It is also probable that the handsomer Rogers varieties will be more widely planted. Vergennes, on account of its productiveness and keeping qualities, should be more generally planted. Early kinds, like Moyer and Moore's Early, lacking in vigour and productiveness, will be planted sparingly. In the province of Quebec, where earliness is a desideratum, these two should find a place. For the more discriminating tastes of the amateur, such fine varieties as Kensington, Mills and Secretary, should not be lost sight of.

RASPBERRIES.

Sarah. (Natural size.)

An illustration from a photograph of Sarah Raspberry described in Bulletin 22, and in the annual report for 1895 is given in this connection. Further experience with this variety emphasizes the necessity of guarding against anthracnose by planting it upon strong sandy loam, and by spraying the plants with Bordeaux mixture.

The raspberry crop was an exceedingly light one owing to two principal causes. First the canes of all varieties were undoubtedly much weakened by the severity of the frost that visited this section the previous December and January, at a time when the ground was unprotected by snow. The scale indicating winter injury, shows this to have been considerably greater than the previous year. Most of the varieties blossomed

fairly and set a fair amount of fruit, but a large proportion of this did not come to maturity owing to the weakened condition of the plants. There were very few suckers thrown up in early summer, another indication of debility. Second, about the middle of the picking season, during a period of dry weather, "red spider" appeared and occasioned much damage, as oily or offensive sprays could not be used at that time. The exceptionally small yields are accounted for in this way. Late in the summer under good cultivation and with the accession of rains, the plants recovered and made a vigorous growth. Previous to this, however, all varieties had been badly injured by red spider.

Notwithstanding these drawbacks interesting results were again, as in 1895, obtained by different methods of treating the same varieties. Of the following 17 varieties of red raspberries, each is made up of two rows 165 feet in length. One row was summer pruned—that is the young growth was nipped back when it had reached a height of 15 to 20 inches. The old wood was also taken from the plants in this row the previous season as soon as the fruit had been harvested. The other row was left untouched as far as pruning was concerned till this spring when the old canes were removed and the dead tips shortened back. These rows have received for three years this kind of treatment. In the autumn the plants occupying half the length of each row have been laid on the ground, placing over the prostrate ends sufficient soil to hold them down. Records are submitted giving the yields obtained from the parts of the rows under the different treatments; of the total yield of each variety and of the relative amount of injury sustained during winter.

Raspberries, 1896.	Pruned, 160 Feet.				Not Pruned, 160 Feet.				Date of First Picking.	Date of Last Picking.	Yield of Pruned Row.	Yield of Unpruned Row.	Total Yield in Boxes from 320 ft.	Estimated Yield in Boxes per Acre.
	Protected.		Unprotected.		Protected.		Unprotected,							
	Scale of injury 1—10.	Yield of 80 feet.	Scale of injury, 1—10.	Yield of 80 feet.	Scale of injury, 1—10.	Yield of 80 feet.	Scale of injury, 1—10.	Yield of 80 feet.						
Heebner	9	5¾	4	4¾	10	11½	5	7¾	July 11.	Aug. 1.	10½	19¼	29¾	677
Springfield	9	7	7	4	9	11	7	6½	do 2.	do 4.	11	17½	28½	649
Royal Church	2	¾	2	1½	4	3¼	5	2½	do 21.	do 1.	2¼	5¾	8	182
Carman	7	15¾	5	7¼	9	26¼	8	13¼	do 2.	do 8.	23	39½	62½	1,422
Thompson's Early Prolific.	8	13¼	7	8	9	28¼	7	18½	do 2.	do 8.	21¼	46¾	68	1,547
Herstine	7	7	4	4	9	14½	6	6½	do 11.	do 8.	11	21	32	728
Parnell	8	8½	4	3¼	8	7¾	5	4½	do 7.	do 8.	11¾	12¼	24	546
Golden Queen	5	3	5	2¾	8	9¼	5	8	do 16.	do 8.	5¾	17¼	23	524
Reider	8	7½	4	3¼	8	7¼	4	2½	do 11.	July 29.	10¾	9¾	20½	467
Brandy-wine	8	10¼	6	6	9	12¾	7	7¼	do 7.	Aug. 8.	16¼	20	36¼	825
Niagara	7	8	4	4	9	12½	6	6¾	do 7.	do 4.	12	19¼	31¼	711
Marlboro	7	1½	4	1	9	9¼	5	5	do 7.	July 27.	2½	14¼	16¾	381
Hansell	8	6	6	3¾	10	13	7	5	do 2.	do 29.	9¾	18	27¾	632
Clark	7	5	5	3	8	7	5	2½	do 11.	Aug. 4.	8	9½	17½	399
Cuthbert	7	3¾	4	1¼	9	6¾	7	4¾	do 13.	July 29.	5	11½	16½	376
Turner	9	6¼	6	5¼	9	4¾	6	4¼	do 7.	Aug. 1.	11½	9	20½	467
Caroline	8	11	6	5½	9	21¼	7	11	do 7.	do 8.	16½	32¼	48¾	1,109

It will be seen (1) that the protected plants were least injured by winter—10 representing no injury, the descending scale indicating increased injury; (2) the yields from the pruned and unpruned rows show a balance again (see Report, 1895, p, 107) in favour of the latter in almost every instance; (3) the protected rows show the larger yields in almost every instance. This last result is quite in line with each year's experience as regards the desirability of protecting raspberries during winter at Ottawa. That the unpruned canes should outyield their fellows pruned, is not in keeping with orthodox teaching upon this point, and suggests the desirability of fruit growers looking carefully into this matter.

BLACKBERRIES.

The yield of blackberries was light, owing to winter injury and summer drought. Snyder gave the largest yield, followed by Agawam. The latter made a very strong growth and showed less injury by cold than any in the collection. There was practically no difference in the time of ripening of the main crop of Snyder and Agawam.

Some mulching experiments were tried in 1895, during the picking season. A portion of the plants of three leading varieties was mulched with green rye, with a view of holding the moisture in the ground in this way instead of using the cultivator. The result last year was a light increase in yield of the plants so treated. This year records of the yields of the mulched and unmulched were not taken, but there was a marked difference in the vigour of the two series, this difference being decidedly in favour of mulched rows.

BLACKBERRIES—YIELDS, etc.

Variety.	Length of row, in feet.	Date of First Picking.	Date of Last Picking.	Yield in Boxes.	Estimated Yield in Boxes, Per acre.	Showing Injury from Winter 1895-96 Scale : 1–10.
Snyder	330	July, 25	Aug. 12	39¼	863½	8
Agawam	330	do	do 12	33¼	731½	8
Erie	69	Aug., 4	do 12	4	420	7
Taylor's Prolific	330	July, 29	do 12	19	418	5
Ancient Briton	165	Aug., 4	do 12	9	396	8
Wachusetts	330	July, 25	do 12	15	330	7
Early Cluster	170	do 25	do 12	7¾	325½	7
Kittatinny	315	do 27	do 12	14	322½	6
Wilson, Jr	57	Aug., 1	do 12	2¼	286	1
Nevada	165	do 4	do 12	6	264	2
Wilson's Early	132	do 1	do 12	3	165	4
Western Triumph	330	July, 27	do 12	3¾	82½	1
Stone's Hardy	288	Aug. 4	do 12	3¼	81¼	....
Tecumseh	150	July, 8	do 8	¼	12	1

Cultivation.—All varieties of blackberries should be protected in winter in this locality. This protection is best secured by bending the canes to the ground in the fall and partly covering them with earth. To do this successfully, nip the young shoots at three feet high and pinch the laterals later in the season. The plants should be in hills more or less regularly and about three feet high in the autumn. To lay them down without breaking, is very difficult even with the exercise of the greatest care, a few canes will be broken, allow for this by having five to seven canes in each cluster ; remove a little soil from the side of the hill to which the canes are to be bent, gather the canes together with a six pronged fork, and with the foot press the crown in the same direction as the canes are to be inclined. Some soil should be thrown upon the crowns as well as upon the tops. Bend them in the line of the row, so that they will overlap and thus mutually assist in collecting and holding the snow.

CRANBERRIES.

The interest in the cultivation of this fruit is increasing each year, and many letters of inquiry like the following have been received :—"I have about six acres of land in the bed of an old mill pond, most of which, when dried for a year, will make good workable land. It has one or two feet of muck on top of the natural soil. It grows an immense crop of weeds every year. I could arrange it so that this area might be flooded in the fall or spring, if that would be of any advantage." This is quoted in order to draw attention to a common misconception of the essential requisites for successful cranberry culture. While facilities for flooding are indeed indispensable, yet the possession and use of these facilities will not make cranberries grow, and fruit successfully in uncon-

genial soil. Cranberries occasionally succeed on a mud bottom, but this is the exception. When the ground is rich, as is often the case in hollows, subject to the wash from surrounding hills, the plants, as growers say, "run to vine," and do not produce much fruit. A soil of this nature would be much improved by a heavy "sanding." The weeds and upper turf might be removed in the autumn, and the sand transported during the winter months. A covering of four to six inches would be advantageous on rich alluvial soils. This keeps down weeds and prevents a too rank growth of the cranberry vines.

The cost of preparing and bringing marsh land into a condition suitable to cranberry culture varies much, depending upon the condition and character of the swamp. If there is much clearing to be done the cost will materially be increased. It is nearly always necessary to apply a coating of sand—except in such instances as a thin covering of muck overlies a sub-stratum of sand, when the latter may be brought up by ploughing. Nova Scotia growers, with favourable conditions, estimate the initial outlay to range between $60 and $100 per acre, including $10 to cover the cost of five barrels of vines.

The first car load of cranberries was shipped from Aylsford, N.S., in 1892. This is also believed to have been the first complete car of cranberries from the Annapolis valley. Mr. Henry Shaw, of Waterville, writes that in 1894 there were 1,400 barrels sold. This year the estimated crop amounted to 3,000 barrels produced in the same region. Bog land is being rapidly reclaimed for this purpose. It should be remembered per contra that the crop of 1893 was nearly a total failure on account of frost, and that 1895 saw another severe frost visitation, which destroyed a great part of the crop. Marshes, well dyked, ditched, and with good flooding facilities, if properly managed, will frequently escape damage by late frosts when others uncared for will suffer injury. Cranberry culture is receiving some attention in Prince Edward Island. Mr. C. R. Dickie, of Muddy Creek, P.E.I., has been growing them with a fair degree of success for some years. Late spring and early autumn frosts are the chief drawbacks.

Prof. John Macoun, of the Geological Survey, has very kindly given me the following note on the distribution of the two Canadian species :—

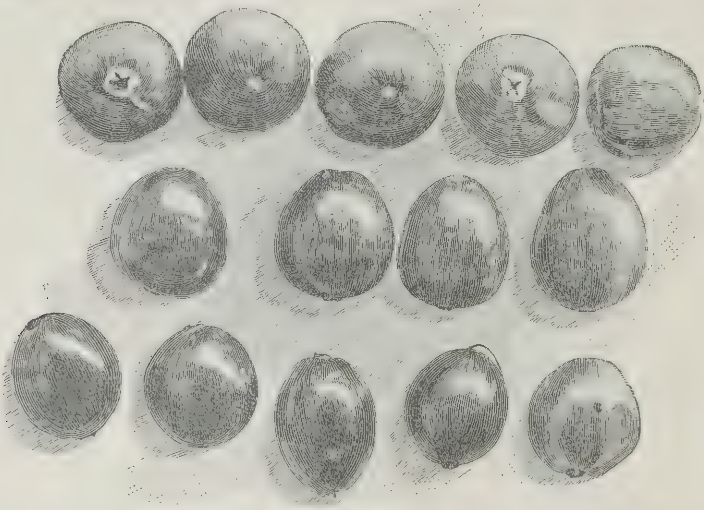
"I find that the cultivated Low Bush Cranberry, *Vaccinium macrocarpum*, although found in Ontario is not common there, but in Quebec and the Eastern provinces it is quite common. Its usual habitat is in soft mud on the borders of ponds and not in peat bogs as *Vaccinium oxycoccus* affects. It would follow then that the right soil for the cranberry is black muck and not peat as I have sometimes thought. This species can be distinguished from *V. oxycoccus* by its flat leaves and having the flowers at the ends of the last year's branches."

"My son, Mr. J. M. Macoun, has written an article on the other Low Bush Cranberry, known in New Brunswick by the name of Wolfberry (*V. Vitis-idaea*), this is in part as follows :—Along the Gaspé coast and the north shore of the Gulf of St. Lawrence, the fishermen's families gather this fruit in large quantities for their own use or for sale, calling it the Low Bush Cranberry; and throughout the whole of northern Canada, hunters and trappers, as well as native Indians, have frequently to depend upon it for food when game and fish are scarce. Deemed of no value in the warmer parts of Canada, and pronounced by Gray to be acrid and bitter and scarcely edible, it seems when in its home in the cold rocky woods of the north or along the shores of Hudson Bay or the Arctic Ocean, to derive size and flavour from the very conditions that dwarf and kill its less hardy competitors."

CULTIVATED TYPES.

Although cranberry culture is a comparatively new industry in Canada, a few noteworthy selections have already been made from the wild species. These are being cultivated with success and appear to meet the requirements of the market. It does not seem necessary or even desirable that plants should be imported from the Atlantic States by intending planters. It would seem desirable, however, that the merits of these more southernly types should be determined by conclusive and careful trial, in one or more of the best Canadian bogs, so that authoritative data might be secured. It should be remembered in this connection that thus far Canadian bogs have not been seriously infested with injurious insects; in importing plants healthy non-infested stock should

be procured. I am of the opinion that we have in Canada varieties fully equal to foreign kinds, and probably much better adapted to Canadian conditions.



Cherry.

Bell.

Neville.

During the early part of November Mr. Shaw, Waterville, N.S., forwarded to this office samples of four of the leading types selected from native cranberries as found in King's County.

BELL (of *Nova Scotia*) medium size, pear shaped bright red with occasional mottling of lighter red. Flesh firm stained with red. When cooked this makes a highly coloured sauce; rich acid in flavour and without astringency.

CHERRY (of *Nova Scotia*).—This seems to be the largest of the native berries some times measuring $\frac{7}{8}$ of an inch in lateral diameter. Its axial diameter some times reaches $\frac{5}{8}$ of an inch. Cherry resembles quite closely in form the Cape Cod variety of that name. Large, roundish oblate, ground colour, yellowish white, mostly covered with patches of light red. Flesh firm. Good keeper. When cooked the flavour is pleasantly acid without astringency or bitterness. Very good.

NEVILLE.—Medium size, oval in form, colour deep crimson; flesh firm, with a decided trace of astringency in the skin which becomes more pronounced on cooking it. Sauce bright claret colour, fairly good though requiring more sugar than Cherry or Bell. It makes a beautiful jelly, firm and dark crimson in colour.

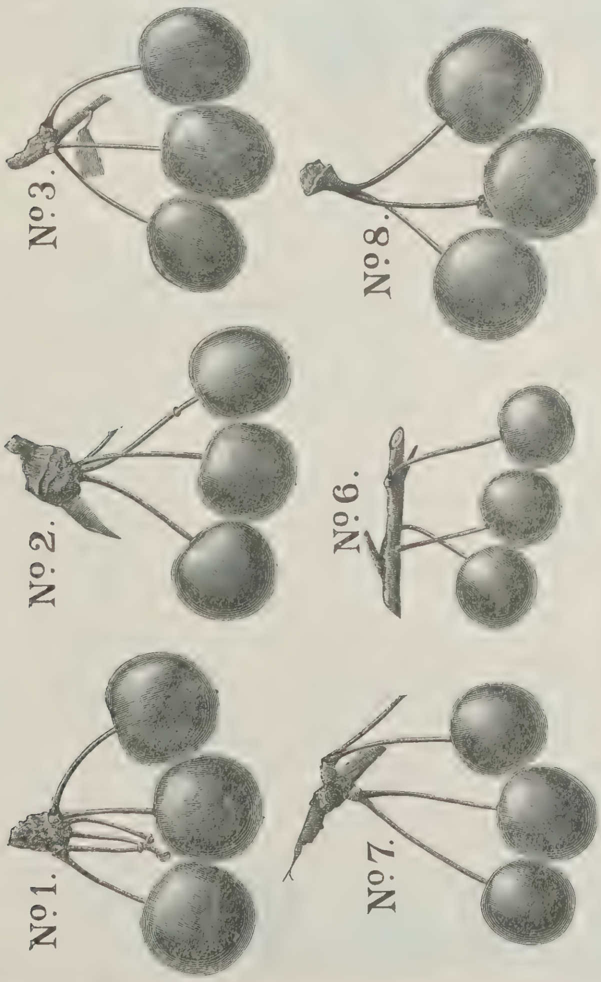
Shaw (natural size photographed.)

Shaw.—Named in honour of Mr. Henry Shaw, of Waterville, N.S., who states that he found this variety in a wild bog on the Gaspereaux. Berry of medium size broadly

ovate—intermediate in form between Bell and Neville—purplish red in colour. Flesh deeply coloured throughout, moderately acid. This is said by Mr. Shaw to be an exceptionally hardy variety. Cooking qualities not tested.

IMPROVEMENT OF THE SAND CHERRY—*Prunus pumila, L.*

Attention was called in the annual report for 1894, page 131, to experiments in progress, having for their object the amelioration of this native fruit. It was hoped at that time that the form under experiment would be found sufficiently hardy to withstand the climatic severities of Manitoba, if not the whole North-west. The hope has not been fully realized. So far, seedlings of the form illustrated in my report for 1894 have not proved much more than half hardy at the branch farm at Brandon or at Indian Head—that is without protection. Many seedlings of the original stock have been fruited since my first report was given. A few of the second generation bore fruit this year also. Selections of the best types of those which fruited first have been made, due attention being paid to the various desirable characteristics and qualities expected in a fruit of this kind.

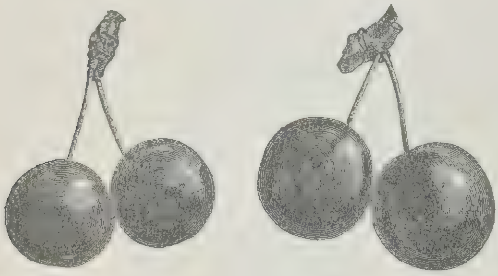


Types of sand cherries appearing in a single batch of seedlings.

The accompanying photographic illustration shows the remarkable variation in size. This feature is indicative also of the variation found to prevail with regard to season and flavour.

SAND CHERRY GRAFTED ON NATIVE PLUM STOCK.

While plums or cherries have not taken readily, either budded or grafted, on sand cherry stocks, yet when the conditions are reversed and the native plum *(Prunus Americana, L.)* is used as the stock, a ready and permanent union has been effected. Scions of a selected type of sand cherry, which were inserted into two year old seedling plum stock—about a foot from the ground—in the spring of 1894, bore a good crop of fruit this year, and made, in addition, a very satisfactory growth. The remarkable thing about the fruit was that it was distinctly better in quality and considerably larger than that borne the same season upon the original parent plant, although the fruit of this latter was fully up to normal size. I am unable to say that we may confidently look for a continuation of this improved size and quality, nor that the union between scion and stock will be permanent. At present, this seems to offer a field for interesting and profitable experiment.



Own roots. Topgrafted on plum (*P. Americana*).

RUSSIAN MULBERRY.

Morus alba tatarica, Descf.

This tree was brought to America about thirty years ago by Mennonites from Western Russia. It is thought by some to be a cross between *M. nigra L.* and *M. alba tatarica*, Descf., in other words a hybrid form peculiar to that region. All American trees of this species have been grown from seed; this has of course given rise to considerable variability with regard to the size and appearance of the fruit. Enterprising tree agents, not over-scrupulous, have taken advantage of the fact that this tree is popular in the western states, on account of its rapidity of growth and tenacity of life, and of the fact that in some instances fruit of edible size and quality has been found, to systematically boom the tree in the east, as being valuable for ornament, for timber and for its fruit. The tree undoubtedly possesses many desirable characteristics; it grows readily and rapidly from seed; it is easily transplanted; it is fairly hardy and if its terminals are injured by winter the growth the following year is as vigorous as ever.

The Fruit.—It is the fruit with which we are most concerned. The same enterprising tree agents just referred to, sold trees of Russian Mulberry in the province of Quebec, some years ago as high as $3 each, or "$5 for a pair." Buying and planting the trees in pairs ensured their fruitfulness! In an article before me by a Kansas writer appearing in the Ontario Forestry Report for 1882, the fruit is described as follows: 'About the size of blackberries, has a sub-acid sweet taste and is used for dessert; it also makes a pleasant light wine, and the leaves are largely used for silk worm food." I have never seen fruit of the Russian Mulberry as large as blackberries. A number of trees were planted by the late Chas. Gibb, at Abbottsford, Que., about eighteen years ago. They grew thriftily and began to fruit seven or eight years after planting. No tree bore fruit exactly like that of any other, the variation being chiefly in regard to colour and size. The fruit on all the trees ripened during the early part of August. The colour varied from light pink to dark red. Selected seedlings grown from this seed are on trial at Ottawa. The Russian Mulberry as a fruit bearing tree has very little if any value at the present time. It is possible that useful varieties may be developed by hybridization and selection. The above illustration of the fruit is made from a photograph of some of the largest berries in a single spray-like cluster.

Russian Mulberry. Natural size.

Varieties of Apples Planted Since 1888.

This list does not include unintroduced varieties including seedlings on trial.

American or of Early Introduction.		European and of Recent Introduction.	
Living.	Failed.	Living.	Failed.
Arkansas Black.	American Pippin.	Anisovka, M. 32.	Ananasnoe (Pine Apple).
Allen's Russet.	Arkansas Beauty.	Anisim, 18. M.	Avendrusia.
Alexis, Baldwin.		Annis, 32. M.	Avenarius.
Andrew's Sweet.	Bombarger.	Antonovka.	Alfister (Warsaw).
August.	Benoni.	Antonovka 236, 26 M.	Aucubifolia (M).
Arthur.	Brewington.	Antonovka (Fisk).	Argentueil Seedling.
	Beauty of the World.	Aport No. 252.	
Ben Davis.	Bottle Greening.	Almond Reinette No. 4.	Babushkino. M.
Brockville Beauty.	Belle de Boskoop.	Alexander, M.	Beresinskoe No. 122 M. B.
Bethel.	Baldwin.	Arabka, Winter (Fisk).	Beel Solotskoe.
Babbit.	Blue Orange.	Arkad (Grell).	
Baraboo.		Antonovka (Ansjutin).	Citron (Vilne).
Bell Pippin.	Cooper's Market.	AntonovkaWhite(Koslov)	Cinnamon Streaked.
Baxter.	Chenango Strawberry.		Christmas, No. 477 Beadle
Bessie.	Cranberry Pippin.	Blushed Calville.	
Beecher's Red.		Basil The Great.	Dinnaya.
Bailey's Sweet.	Dominie.	Bergadoff (Sk).	Danish Kantapfel.
	Dickson.	BeautifulArkad No. 453 B.	Duchovoe.
Canada Baldwin.		Burlovka, No. 183 (Beadle)	
Calumet.	Early Harvest.	Boiken.	Erdbeer Streifling.
Canada Red.		Blackwood No. 407.	
Crawford.	Fall Pippin.	Bode.	Foundling.
Cox's Orange Pippîn.	Fallawater.	Broad Green, No. 157 M.	Fonaric.
Clayton.	Fall Jennetting.	Borsdorf, No. 402.	French Pippin.
Cullens, keeper.		Bogdanoff Steklianka.	
Cullender.	Giant Swaar.	Bogdanoff.	Grand Duke Constantine.
	Gravenstein.	Broad Cheek.	Gros Mogul.
Duke of Connaught.		Borovinka Koslov.	
Duchess.	Hurlbut.	(Niemetz).	Howard's Best Russian.
Delaware Red Winter.			
Dery's Baldwin.	Jolti Calville.	Cinnamon No. 50 Vor.	Imperial Citron.
Decarie (Fisk)	Jolti Beil.	do 322 B.	
Davis Seedling (from Mrs.		Champagne Pipka.	Keiv Reinette.
Foster, Knowlton, Q.)	King.	Cross No. 413.	
Dr. Walker,	Keswick Codlin.	Charlamoff.	Long Arcad.
Dempsey No. 80.	Kellogg Russet.	Cinnamon Pine, No. 375.	Large Bogdanoff.
		Crimean.	Large Gruner-Guelder.
Early Colton.	Lord Suffield.	Court-pendu-plat.	
English Pippin.	Lady Henniker.		Lapouchoe No. 470.
Excelsior (crab.)		Dvinnoe Solovieff.	(Beadle).
Edith.	Mother.		
Eisike.	Mann.	Enormous.	Marble.
	Maiden's Blush.	Extra Solovieff.	Muscatelnoe.
Fameuse.	Mason's Orange.	Early Prolific, No. 332 B.)	Malus Toringo.
Family Favorite.	Magog Red Streak.	Early Sweet.	Moregi.
Frazer's Russet.			
Flushing Spitzenberg.	Nero.	Furst Taffet Apfel.	Nitchners.
Fanny.	Nonpareil.		
Forest.		Grand Sultan.	Prolific Annis.
	Osceola.	Gipsy Girl.	
Gano.		Golden White, No. 978.	Rosenrother.
Gideon No. 6.	Perry's Russet.	Grandmother, No. 469-6M.	Rother Annanas.
Gideon No. 9.	Peck's Pleasant.	German Calville (Fisk).	Riga Transparent.
Gideon No. 10.		Golden Stone (Niemetz).	Rother Winter.
Grimes' Golden.	Red Russet.	Green Sweet, No. 169.	Rhennischerbohn, M
Golden Ball.	R. I. Greening.	Gorka Pipka, No. 265 B.	Revel Borsdorf.
Green Fameuse.	Red Beitigheimer.	German Skrute, No. 371 B.	Rotta.
Glowing Coal.		Golden Reinette.	Red Eiser.
Gideon.	Stump.	Good Peasant.	Rambour Riga.
Golden Russet.	Sutton's Beauty.	Gremuck (Niemetz).	Red Swedischer.
Ghent (unknown).	Stuart's Golden.	Gul Pembe, (Niemetz).	Roschdestvenskoe.
	Stark.		(Christmas Fisk).
Hart's Seedling.	Saxton.	Hare Pipka, No. 202 B.	

Varieties of Apples Planted Since 1888—*Continued.*

American or of Early Introduction.		European and of Recent Introduction.	
Living.	Failed.	Living.	Failed.
Huntsman.	Spitzenburg.	Himbeer.	Stettiner Kantapfel.
Hartshorn.	St. Johnsbury Sweet.	Hative de Crimea.	Stripe.
Haas.		Herren, No. 315.	Skrischapfel (M).
Hardisty No. 2.		Hibernal.	Striped Calville M.
Hardisty A.	Utters Red.	Handsome White, No. 450 B.	
Hardisty X.			Tuttle No. 5.
Hardisty Seedling.	Vandevere.		Table Apple.
Heidi.	Victoria (Gibb).	Kremers, No. 284 B.	
Harkison,		Kruder, No. 17 M.	Winter Lievland.
Hebbel White.	Wine Sap.	Kremers, No. 284 Glas.	White Bogdanoff.
Headley.	Warners King.	Kursk Annis, No. 984.	White Rambour.
Hardy.		Karabovka, No. 21 M.	
Holly.		Krimskoe, No. 65 M.	Yellow Stettin.
Hamilton.		Kara-Synap A.	
Hartman (C. W.)		Kara-Synap B.	
Ivanhoe.		Lead.	
Inkerman Greening.		Little Hat.	
Iowa Beauty.		Longfield.	
		Lubsk Queen.	
Jake (The).		Lubsk Queen.	
John Richardson.		Large Annis No. 413.	
Jonathan.		Ledenetz (Gibb).	
Jennie.		Lieveland Raspberry.	
Johnson's Seedling.		Lead (of St. Petersburg).	
		Lebedka.	
King of Pippins.		Lebokey Sweet.	
Kinnaird's Medium.		Lapouchoe (Koslov).	
Lady.		Moscow Pear.	
Lankford.		Melonen.	
Longueuil.		Marmalade.	
Lou.		Meinster.	
Lady Elgin.		Marion (Grell).	
Louis Favorite.		Marion (Solovieff).	
La Victoria Seedling.			
Langford Beauty.		No. 20 M.	
Logan Sweet.		No. 585.	
Late Winter.		No. 380 Dept.	
Lakes Pippin.		No. 57 M.	
Layman's Red Seedling.		No. 135 M.	
Layman's Red Winter.		No. 569 M.	
Louise.			
Lawver.		Ostrakoff No. 472 B.	
Lord (Sweet).		Orel No. 1.	
		Ostrakoff Glass (Fisk).	
Mitchell's No. 1.		Orel.	
Mitchell's No. 2.		Osimoe. 7 M.	
Mary (Mitchell's No. 3).		Orel No. 5.	
Mitchell's No. 4.		Orel No. 980.	
Mitchell's No. 5.			
Mammoth Black Twig.		Plodovitka (Koslov).	
Minkler.		Pointed Pipka.	
Mo. Pippin.		Possart.	
Martha.		Paperovka (Niemetz).	
Mickel.		Plikanoff.	
Malinda.		Polosatoe Calville (M).	
Milwaukee.			
McMahan White.		Rosovka Rosy No. 406 (Beadle.)	
McIntosh Red.			
		Romna, No. 599.	
Newman No. 19 (Gibb).		Rosy Repka.	
Northern Spy.		Romna No. 599.	
North Star.		Rosovka, Rosy No. 406 (Beadle).	
Newton.			
Newell's Winter.		Red Subluck, No. 26.	

VARIETIES OF APPLES PLANTED SINCE 1888—*Continued.*

American or of Early Introduction.		European and of Recent Introduction.	
Living.	Failed.	Living.	Failed.
Nodhead.		Reinette Grise, No. 28.	
		Repka Winter.	
Ontario.		Rosy Repka (200).	
Orange Winter.		Resonart.	
Orel No. 7.		Russian Transparent.	
Ohmer.		Rambour Reinette, No. 502	
October.		Red Reinette No. 316 (Beadle).	
Okabena.			
		Reinette Kievskoe.	
Princess Louise.		Red Serinka.	
Pomme Grise.		Red Repka (200).	
Peach.		Revel No. 338.	
Peach, M & H.		Red Stettiner (Fisk).	
Peasegood.		Russian Tyrol.	
Pewaukee.		Red Annis No. 985.	
Patten's Greening.		Red Queen No. 316.	
Peffer.		Revel Glass No. 170 B.	
Palmer.		Red Duke.	
Pewaukee Russet.		Romenskoe (Gibb).	
Plumb's Cider.		Repolovka I. M.	
Patten's Duchess No. 4.		Rosy Voronesh No. 1277 B.	
Peter Smith.		Round Borsdorf No. 356 B.	
Primate.			
		Simbirsk No, 1.	
Quebec Sweet.		Sweet Pipka (Beadle).	
		Simbirsk No. 2.	
Red Detroit.		do No. 4.	
Rose.		do No. 5.	
Rawles Janet.		do No. 9.	
Rainbow.		do No. 10.	
Rubicon.		do No. 11.	
Red Rudolph.		Saccharine.	
Renaud Seedling.		Sugar Sweet.	
Red Astrachan.		Sara-Synap (Niemetz).	
Roxbury Russet.		Skrut (Grell).	
Reynard.		Stone Antonovka.	
Ribston Pippin.		(Govt. of Tchernigov.)	
Rome Beauty.		Sweet Pipka (Beadle).	
Roger's (Hill Centre).		Stettin No. 80.	
Ruby Gem.		Switzer.	
Rolfe.		Sugar Miron, No. 368.	
Red Gravenstein.		Sweet Borovinka No. 874.	
Richard's Graft.		Sablouke d'Automme No. 10.	
Schantz (E. M.)		Sablouke (Grand Arronde No. 9).	
Starr (C. R. H.)			
St. Lawrence.		Skrisck Apfel (Grell).	
Stone.		Schwarze Gans. M.	
Snyder.		Svinetz No. 426.	
Smith's Seedling.		Sweet Stripe No. 12.	
Seek-no-Further.		Silken Leaf.	
Scarlet Pippin.		Serinka, No. 107 M.	
Spencer.		Sandy Glass, No. 24 M.	
Stark.		Scented, No. 264 B.	
Sarah.		Sultan, No. 344 B.	
Smith's No. 1.		Svintzovka.	
Shaker Pippin.		Sklanka Bogdanoff.	
Sind Centre.		Skarlock Reinette.	
Smith's No. 2.		Striped Winter (Budd).	
Sambo.			
Shiawassee Beauty.		Taffet Winter.	
St. Hilaire.		Tetofsky.	
Saxton.		Toskin No. 4.	
Scott's Winter.		Thin Twig.	
Swayzie (Pomme Grise).		Transparent, No. 12.	
Sharp's Russet.		Tiesenhausen No. 190.	

Varieties of Apples Planted since 1888—*Concluded.*

American or of Early Introduction.		European and of Recent Introduction.	
Living.	Failed.	Living.	Failed.
Senecal.		Titovka (Gibb).	
Salome.		Taffet Winter. Proskau (Gibb).	
Sops of Wine.		Throne No. 243 B.	
Thompson's Seedling No. 63		Titovka (Koslov).	
do 35.		Titovka (Solovieff).	
do 26.		Ukraine (Gibb).	
Talman Sweet.		Ukraine, No. 290 M.	
Thaler.		Vargulek No. 55 (Vor).	
Upp Apple, from Hope.		Vargulek (Grell).	
Uncle Sam.		Voronesh Reinette, No. 282 B.	
Van Deman.		Vargul (Fisk).	
Wright (G. A.)		Voronesh Sweet.	
Wealthy.		Winter Rambour (Niemetz).	
Watterson No. 3.		White Borovinka.	
White Winter Calville.		White Naliv.	
Wolf River.		White Pigeon No. 317 (Beadle).	
Williams Russet.		White Borsdorf (Fisk).	
Walworth Pippin.		Workunok No. 565 B.	
Walter.		White Russet.	
Washington Strawberry.		White Transparent.	
Watterson No. 4.		Yellow Annis, No. 987.	
Winter St. Lawrence.		Yellow Arcad.	
Windsor Chief.		Zolotoreff (Niemetz).	
Walbridge.			
Wisconsin Spy.			
Wagener.			
Winter Duchess.			
Winter Bough.			
Yellow Bellefleur.			
York Imperial.			
Yellow Transparent.			

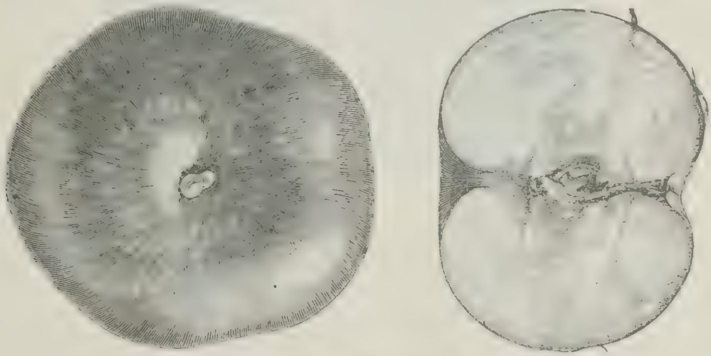
CRABS.

Ball's Winter.	Bowman.		
Brier's Sweet.	Coral.		
Chicago.	Gen. Grant.		
Dartmouth.	Hesper Rose.		
Excelsior.	Paul's Imperial.		
Hyslop.	Red Siberian.		
Jumbo.	Waxen.		
Lord's Late.	Whitney.		
Martha.			
Marengo.			
Orion.			
Orange.			
Oblong.			
Ogilvie.			
Rose of Stanstead.			
Transcendent.			
Van Wyck.			

DESCRIPTIONS OF VARIETIES.

The following varieties have come specially under my notice during the year :—

Arctic—Introduced by O. K. Gerrish, nurseryman, Lakeville, Mass. It has not been fruited at Ottawa. Trees and fruits were examined in the orchard of H. H. Hill, Isle La Motte, Grand Isle Co., Vermont, late in September.



Arctic.—Reduced one half.

Description.—Large, varies in form from oblate to round and roundish conic with a marked tendency in large specimens to become distinctly five-sided, sometimes two-lobed. Typical form roundish oblate. Skin smooth, yellow, but completely covered with rich crimson deepest, next basin. This is overspread with a delicate bloom, interpersed with large buff coloured dots. Cavity shallow broad, lined with green or russet ; stem short, thick inserted. Basin, irregular ; calyx closed. Very handsome. Flesh, yellow, firm, rather mealy, but melting, mild sub-acid, quality, medium to good. Season, January and February. Some specimens examined late in the season show a tendency to rot at the core.

Tree upright, spreading branching, somewhat like a Greening ; forks, strong ; well knitted ; twigs, stout ; bark, dark coloured ; leaves, large, rich, glossy green ; altogether vigorous and healthy looking, as seen,growing under good cultivation.

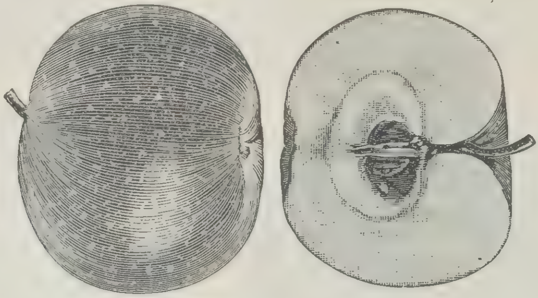
Prof. Waugh, of Burlington, writes as follows :—"There are conflicting reports regarding the origin of the 'Arctic' apple. O. K. Gerrish, of Lakeville, Mass., U. S., claims to be the only original discoverer and introducer. He says the 'Arctic' apple originated at Cape Vincent, N.Y. The original tree grew near the St. Lawrence River in a very exposed situation. Mr. Gerrish says he has been growing and disseminating the variety for ten years, and that he has the most favourable reports from it—even in the coldest northern sections. Mr. Gerrish furnished the stock for Isle La Motte. It seems that there are numerous mixtures however. Some professional grafters in Northern New York have been putting in Kings for 'Arctic.' Our U. S. division of pomology is not yet satisfied as to the identity and history of the variety."

Mr. Gerrish in a letter recently received says :—"The Arctic is a chance seedling, it having sprung up along the bank of the St. Lawrence opposite Wolf Island, Canada, about 30 feet from the shore." He claims also to have purchased the original tree which after propagating he destroyed some years ago.

CANADA BALDWIN.

Description.—Medium size ; roundish oblate. Skin, smooth, yellow, overspread with splashes and stripes of carmine and crimson interspersed by numerous large dots. Cavity, wide, deep, smooth ; stem, stout, 1 inch long. Basin, medium depth, calyx closed. Flesh, white, frequently tinged with pink extending almost to the core, firm, sometimes inclined to be dry and corky, fairly juicy sub-acid with peculiar and not

unpleasant suggestion of astringency ; quality, good ; season, mid-winter and later. This variety shows a tendency to "scab" on light soils.



Canada Baldwin. (Reduced one half.)

Tree a strong upright grower with prominent branches. On light warm soils it is much affected by sun-scald and bark-splitting. On clay, or clay loam it seems to be more at home and is giving satisfaction in locations of this kind in the eastern townships and on the St. Lawrence in Western Quebec, where it is well known. Mr. N. C. Fisk, of Abbotsford, Que., says that it originated from seed of *Pomme de fer* on the farm of Alexis Dery, St. Hilaire, Que. It was brought by Mr. Fisk to Abbotsford in 1855, who propagated and introduced it to the public under the name of Canada Baldwin.

BEDFORDSHIRE FOUNDLING (*Cambridge Pippin*, Hogg).—Grown by J. D. Roberts, Cobourg, Ont.

Description.—Large, roundish ovate, ribbed, prominently near calyx. Skin rather rough, dark green, pale yellow when fully ripe ; dots, large, buff coloured. Cavity deep, broad at base ; stalk, short, inserted ; basin, deep, narrow, angular. Calyx, open ; Flesh, yellow, tender, mild, sub-acid, melting ; season, late winter ; an old English variety.

CORNISH GILLIFLOWER.—Grown by Mr. J. D. Roberts, Cobourg, Ont.—Large oblong-ovate, angular ribbed. Skin, rough, dull green striped with bright red, marked with patches of russet ; cavity, shallow ; stalk, $\frac{3}{4}$ to 1 inch long. Basin, narrow angular ; calyx large closed. Flesh, yellow, firm, aromatic ; quality, good ; season, winter. This has been known in England since 1813, when it was brought to public notice. In England it is said to be unproductive.

DORKHAM RUSSET.—From Wm. Craig & Son, Abbotsford, Que.

Description.—Medium size, round, very slightly conical. Skin, bright red, partly covered with patches of clear buff coloured russet mingled with crimson, handsome. Cavity rather deep, lined with russet ; stem, medium length. Basin, moderately deep regular. Calyx, small, closed. Flesh, white, juicy of the russet type but not tough, brisk, sub-acid, good quality ; season, October to December.

Tree is a round topped rather spreading grower fairly hardy ; began to bear at eight years from planting and has been fairly productive since that time ; an exceedingly handsome apple of good quality, but valuable principally to the amateur. It drops from the tree early in the season thus destroying its commercial value.

GANO.—From Storrs & Harrison, Painesville, Ohio. Planted spring 1891.

Description.—Large, round, sloping towards calyx, regular. Skin smooth, oily, thick ; a yellow ground covered with dark glossy diffused red, especially next cavity. Dots white obscure. Cavity deep, round, smooth ; stem slender, of medium length. Basin medium size, slightly wrinkled ; calyx, partly open. Flesh white, a little tough and dry. Quality not quite good, lacking in sprightliness and in juice. Core large ; seeds large, plump. Season probably January. Resembling Ben Davis very closely in character of skin.

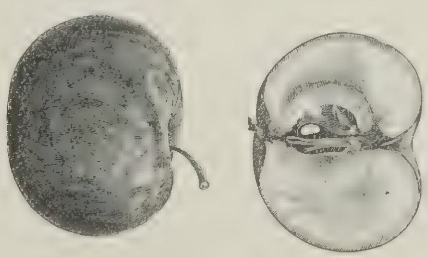
Tree is a spreading grower, fairly vigorous. The terminal shoots have not been injured by winter's frost thus far, though the stem of one of the trees planted has suffered to some extent from sunscald. This variety is said to have originated in Missouri, and is claimed by some to be a seedling of Ben Davis, which it resembles in certain respects.

LONGEVITY.—Originated with Dr. D. Young, Adolphustown, Ontario.

Description.—Medium size, round, regular, with tendency to a conical form. Skin smooth, somewhat oily. Colour yellow ground, nearly covered with blotchings of dark red. Dots of a light grayish colour, large but rather obscure. Cavity deep, narrow, lightly russeted below; stem slender, inserted. Basin large and broad, sometimes wrinkled; calyx small, closed. Flesh yellowish, fine grained, remarkably firm, juicy, but melting brisk, sub-acid. Quality good. Core small, open. Seeds small. Perhaps not so aromatic as a spy, but much superior to Ben Davis.

Of the tree and its manner of origination, Dr. Young writes, as follows in Dec., 1896: "As much as 50 or 60 years ago there were seedling apple trees set out on many farms about here. They appear to be mostly all dead, except the tree in question (Longevity), which tree is remarkably healthy and fresh looking still. I heard of the tree shortly after coming here to live, but until I chanced to see and eat some of the apples late on in the season I paid no attention to it. Soon after that I grafted some hardy trees with scions from it, believing that the stock could be disseminated profitably in some way, because the apple is of good size and appearance and of fine grain, and in the following spring and summer very palatable, in addition to being a remarkably long keeper. In the autumn of 1894, having two barrels of them for the first time I sent them to Messrs. Hart & Tuckwell, Montreal asking them to test their keeping qualities; but about the first of June following, Mr. Walter Paul offered them $50 for the two barrels. It was too strong a temptation and they sold the two barrels for that amount. In the fall of 1895 I shipped them two more barrels which they kept over, and I think they still have them in perfect condition." As the two barrels of the crop of 1895 have been kept in a cold storage warehouse under favourable conditions, this somewhat detracts from the value of the keeping test. This variety is now the property of H. C. Graves & Sons, nurserymen of St. Joseph, Mo., U.S. Messrs. Graves & Sons kindly forwarded scions of Longevity last spring for trial at the Experimental Farm. Unfortunately some of them were lost by the failure of the stocks upon which they were set owing to root killing. These facts are given to the public at this time in order to anticipate queries regarding the history and value of this apple, as it will probably be offered to the trade next year.

MARTHA (*Crab*)—Experimental Farm. Large, $2\frac{1}{4}$ inches laterally by $1\frac{7}{8}$ inches axial diameter; oblate regular. Skin, smooth, glossy, more or less covered by a pinkish



Martha (Crab). Reduced one half.

blush. Cavity, deep, broad; stem, $1\frac{1}{4}$ inches in length. Basin, broad, moderately deep. Flesh, yellow, crisp, juicy, acid, brisk and pleasant; good. Ripens during the latter part of September. A handsome fruit, valuable for jelly making and desirable, when uncooked, if thoroughly ripened. Tree is of fine pyramidal habit, the side branches being

given off regularly from a central leader and overlapping each other horizontally. The lower ones assume, with age a weeping habit. The leaves are large, light green on the upper side and strikingly pubescent beneath.

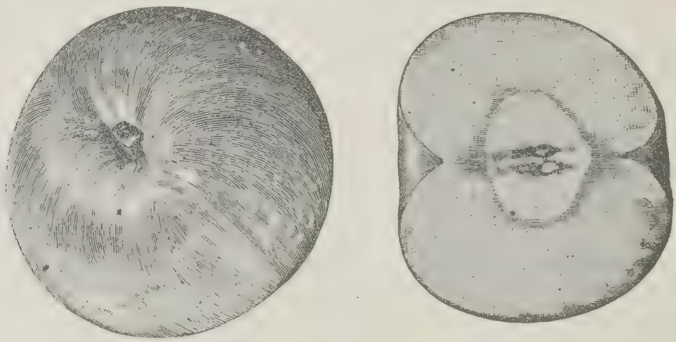
This variety was produced by Peter M. Gideon, Excelsior, Minnesota, who also originated Wealthy, Gideon, Florence, October, Lou and a number of others not so well known. These are all supposed to be hybrids between the Siberian Crab (*Pyrus prunifolia, L.*) and the cultivated forms of the common apple (*Pyrus malus*).

MALINDA.—From C. G. Patten, Charles City, Iowa. Fruited at Experimental Farm. Medium size, irregularly ribbed, sharply conical. Skin, greenish yellow below, covered in part by patches of russet, shaded with pink about basin and on sunny side. Cavity deep, narrow; stem stout, short, inserted. Basin, deep, narrow, corrugated; calyx closed. Flesh yellow, firm, rather pithy and tough, mild, sub-acid, juicy, with a sweetish after taste. Quality fair. Season, late winter.

Tree a slender grower; fairly hardy. Originated in Iowa a number of years ago but it has not been widely planted until recent years, probably owing to the fact that it is slow in coming into bearing.

NORTH STAR (*Syn. Dudley's Winter*).—From Chase Bros., Rochester, N.Y.

Origin.—A seedling of Duchess, originating with John W. Dudley, Mapleton, Aroostook Co., Me. Original tree is now only about fifteen years old, so I am informed by Prof. W. M. Munson, Orono, Me.



North Star. Reduced one half.

Description.—Large, roundish oblate, smooth, regular. Skin, yellow, mostly covered with dark red, suffused, overlaid with light lilac bloom. Cavity, deep, russeted; stem, one inch long. Basin, deep, round, slightly wrinkled. Calyx, large, open. Flesh, yellow, coarse, sub-acid, lacking in fine flavours; quality, not quite good. In appearance a compromise between Wealthy and Duchess. Season, September to middle of October.

Tree hardy, upright with large healthy leaves and small reddish coloured buds.

PARSON (*Parson's Sweet*).—Specimens from Fonthill Nurseries, Welland, Ontario.

Description:—Large roundish, oblique, conical. Skin moderately smooth; colour, yellow, nearly covered with rich dark red, marked with large white or russet coloured dots marbled on the shaded side. Cavity deep, narrow, regular; stem half to three-quarters inch long inserted curved, slender. Basin large, slightly ribbed; calyx, large, open. Flesh white, tender, flaky, fairly juicy, very sweet; core small. A large handsome sweet early winter apple. One of the best of the class.

Mr. A. L. Root, of the Fonthill Nurseries, says: Parson's Sweet originated near Springfield, Mass., being a seedling tree in one of the old New England orchards. It was brought to Geneva, N.Y., by Fowler Bros. about sixteen years ago, and brought to Welland, Ont., by Mr. Root when he came to Canada. Mr. Root says the tree is hardy in nursery, strong and stocky, and as a top graft it has been very productive.

PATTEN'S GREENING—Fruited at Experimental Farm. Medium size, oblate, sloping towards basin. Skin smooth light yellow about cavity, flushed with light pink near basin. Cavity moderately deep, broad, russeted below : stem very short, deeply inserted. Basin broad, slightly wrinkled ; calyx large, partly closed. Flesh, yellowish white, juicy, rather tough in consistency, sharp, sub-acid, quality fair, core small. Season, December to February.

Tree a strong upright spreading grower with large leaves usually healthy. Hardy. Originated by C. G. Patton, Charles City, Iowa, said to be from seed of Duchess. Quality and texture does not impress me favourably considered for foreign market or export purposes.

PALOUSE.—Fruit forwarded by Geo. W. Beebe, Agassiz, B.C., who received the scions from Geo. Rudy, Palouse County, Washington, U.S.

Description :—Large ; form oblong, conic, distinctly five-sided, somewhat oblique. Skin, rich golden yellow, streaked and blotched with pinkish red, bearing numerous small grayish russet dots. Cavity deep, narrow, lined at bottom with green : stem, thick, one to one and a-quarter inches long, curved. Basin shallow, wrinkled. Calyx large, open. Flesh yellow, coarse, with an unripe rather disagreeable odour when cut. Quality poor insipid and without character. Season, mid-winter. This apple resembles Cornish Gilliflower in regard to form and colouring, but does not approach the quality of that variety.

PEASEGOOD NONSUCH—Fruit grown by J. D. Roberts, Esq., Cobourg, Ontario.

Description :—Large, oblate, roundish. Skin, yellow, overspread with stripes and splashes of red and crimson. Cavity deep, narrow, stalk short, inserted, basin, deep, smooth, regular ; calyx large, open. Flesh yellow, tender, juicy, sprightly, sub-acid. Classed with dessert apples by Dr. Hogg. Season, October. An amateur and home market apple. Such large and rather tender apples are exported in good condition with difficulty.

QUEEN (*Queen of Sauce, Dr. Hogg.*)—Fruit from J. D. Roberts, Esq., Cobourg, Ontario.

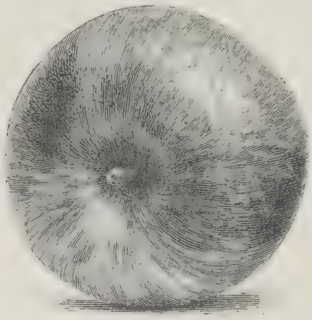
Description :—Largest size, oblate, broad at base, narrowing to calyx, smooth ; skin, yellow, shaded and flushed with russet light red large dots, numerous. Cavity round, lined with russet ; stalk short, inserted. Basin deep, angular ; calyx, open. Flesh, yellowish, firm, crisp, juicy and sugary, brisk and pleasant flavour. Described by Dr. Hogg as a culinary apple. As grown by Mr. Roberts it resembles Alexander in a general way, but is much better in quality, being finer in texture. Season, November.

ROCHELLE.—Fruit received from R. W. Shepherd, Como, Quebec.

Description :—Large or slightly above medium, roundish with conical tendency, sometimes obscurely ribbed. Colour, greenish, yellow beneath nearly covered with red and crimson stripings marked with numerous small dots. Cavity large, sometimes russeted with a protuberance on one side ; stem, short, thick. Basin medium size irregular ; calyx open. Flesh, yellow crisp, juicy sharply sub-acid, quality good. Season, barely mid-winter, in best condition in December. Mr. Shepherd says the tree grew in nursery row from the root of an apple graft received from Wisconsin in 1878 ; that it has never been injured by frost or climate and that it has been productive. Its behaviour when propagated and planted in orchard has yet to be ascertained. In speaking of the origin of this variety Mr Shepherd says :—

"We noticed that the tree was growing from the stock and because it was a fine looking tree we allowed it to grow, and it has never been transplanted since. When the tree first began to bear we saw at once that the fruit was very good, and we have since cut off scions heavily for grafting every year. In 1880 the nursery was removed to another part of the farm and now the 'Rochelle' tree stands between the rows in my 'Wealthy' orchard. The tree is quite hardy, in fact appears very hardy and productive, the fruit is very handsome and keeps till mid-winter ; quality, very fine."

Scarlet Pippin (*Syn, Leeds Beauty*).—Originated at Lyn, Leeds County, Ont., on the St. Lawrence in the vicinity of Brockville, where it has been locally grown for some years. Its value as an autumn dessert fruit has been recently brought before the public through the efforts of Mr. Harold Jones, Maitland, Experimenter for Ontario for apple in the St. Lawrence River district.



Scarlet Pippin.

Reduced one half.

Description :—Medium size, round, inclined to oblate, regular, skin yellow, waxy, nearly always entirely covered with bright to dark crimson in strips or in suffused patches, overspread with a light bloom, altogether exceedingly handsome. Cavity, shallow, broad occasionally showing a protuberance on one side ; stem, short, stout. Basin, almost wanting, slightly wrinkled ; calyx open. Flesh, firm, white, flaky, crisp, melting, sub-acid, juicy, core, small, quality very good ; season, early winter. This variety might be mistaken for McIntosh Red. The flesh is firmer and crisper. As a home market apple it is undoubtedly valuable.

Tree said to be hardy and productive. It has not been fruited at the Experimental Farm.

Mr. John Conn, Kempville, Ontario, says :—" The Scarlet Pippin is a remarkably handsome tree of upright growth ; it is hardy and a heavy bearer. Mr. Borthwick (fruit dealer of Ottawa), gave 50 cents a barrel more for this variety than for Snow (Fameuse) last year." It does not enjoy immunity from " apple spot " but is less attacked than Fameuse.

Van Deman.—From Prof. E. S. Goff, experiment station, Madison, Wis., Top-grafted on Wealthy, 1891.

Description :—Fruited last year and again this season. Medium size ; roundish oblate. Skin smooth, shiny, covered with stripes and blotches of brilliant crimson, overlaid with a delicate bloom. Cavity broad, shallow ; stem, half-inch long. Basin, shallow, corrugated ; calyx, large, closed. Fesh white, flaky, melting and juicy, sharp acid, with a slight tinge of bitterness, good, season that of Red Astrachan. This apple so closely resembles Red Astrachan, that it could easily be mistaken for that variety of which it may be a seedling. The character of flesh is somewhat firmer and it may prove to be a better shipper.

Winter Rose.—Fruit from Mr. John Conn, Kemptville, Ont., originated in the county of Dundas.

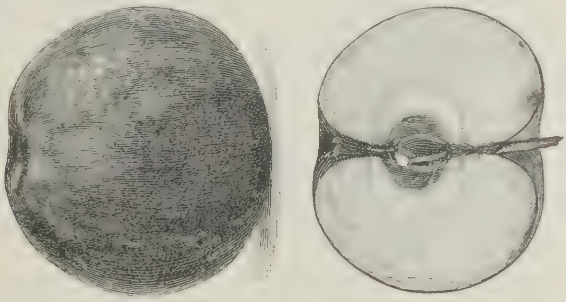
Description:—Large, oblate, smooth and regular towards basin, but irregularly five sided towards cavity. Skin, green, overspread with a dull pinkish blush, and painted with a light gray coating except in a circle around calyx ; cavity, broad, irregularly russeted below ; stem, short. Basin round and smooth ; calyx, large, open. Flesh white moderately firm, melting fairly juicy, very mild sub-acid, almost sweet ; core, large, open. Specimens examined were affected by the "dry rot" described under fungous diseases. Quality good, but not high flavoured lacking in aromatic qualities and spiciness. Inclined to become mealy when fully ripe. Season, January and February.

Mr. Conn has found this variety hardy and productive at Kemptville. Mr. Conn says :—" I send you a sample apple of the 'Winter Rose.' It improves in colour

and quality towards spring and I have proved the tree to be hardy and a prolific bearer on alternate years. An old grafter, named Wagoner, got scions of it somewhere and used to some extent on his crab orchards in the back township of the county of Dundas. It is grown only, as far as I am aware, as a top graft, and it makes a remarkable good union with the stock."

WINTER ST. LAWRENCE *(Mank's Codling, Rambour Barré).*

Description:—Fruited at Experimental Farm. Medium to large, round, slightly conical. Skin yellow, nearly covered with light and dark red in splashes and broken stripes. Dots large, whitish grey, numerous; occasional patches of russet. Cavity broad, rather deep, sometimes russeted; stem slender. Basin small, slightly wrinkled; calyx closed. Flesh white, flaky, rather soft, juicy, brisk sub-acid, melting; quality good. Season, January to February. This variety possesses the Fameuse type of flesh, but does not rank as high in quality as that variety.



Winter St. Lawrence. Reduced one half.

Tree a round-topped, vigorous grower, occasionally sun scalds, but has never been injured by winter at Ottawa. The fruit is not injured by *Fusicladium* to the same extent as Fameuse, but at the same time requires careful spraying. According to the 5th report of the Montreal Horticultural Society this apple was imported in 1833 from Manchester, England, under the name of Mank's Codling, by the late Wm. Lunn of Montreal. It was exhibited and disseminated under various names by different people, but was finally named by the Montreal Horticultural Society about 1873.

VARIETIES OF PEARS PLANTED SINCE 1888.

Living.	Dead.	Cause of death.
Ansault.	Baron de Mello	Blight.
	Beurré Hardy.	Winter.
Beurré de Livonie, No. 38.	Buffum	do
Beurré Slatzsk, No. 39.	B. Canton Horimer?	do
Bessemianka.	Beurré Hardy	do
Bezi de la Motte.	Beurré d'Anjou	do
Baba (Niemetz).	Belle Lucrative	do
Bessemianka, No. 102, Vor. (seedling).	Beurré Superfine	do
Bessemianka, No. 3, M. (seedling).	Beurré Clairgeau	do
Bonchretien, No. 15.		
Bessemianka, St. P.	Clapps Favorite	Blight and winter.
Byrne Large Seedling.	Countess Clara Fays	do
Bartlett.		
	Doyenne d'Eté	Winter.
Czar, No. 15 M.	Double Beurré	do
Cure de Carnot.	Doyenne Boussock	do
Coleman's Butter.	Duchess de Bordeaux	Winter and blight.
	Duchess	do

Varieties of Pears Planted since 1888—*Concluded.*

Living.	Dead.	Cause of Death.
Dula Medviedovka.	Easter Beurré	Winter.
Double Beurré.	Fitzwater	Winter and blight.
Dr. Reeder.	Frederick Clapp	do
Dempsey.	Goodale	Winter and blight.
Dvinnoe Solovieff (Niemetz)	Gros Zucherbirn	Blight.
Early Bergamot (Budd).	Howell	Winter.
Flemish Beauty.	Hamburg Bergamot	Blight.
French Seedling (Amherstburg).	Indian Queen	Winter.
Flat Bergamot, No. 396.	Junjferbirn	Blight.
Gliva Kurskaya.	Juicy Gliva	do
Gleck (Niemetz).	Krasovka (Niemetz)	Blight.
Gûte Gruner.	Kansas Seedling	do
Gakovka (Gibb).	Lawrence	Winter.
Helen No. 4 (Peffer).	Longstem	Blight.
Honey (Budd).	Lutovka	do
Josephine de Malines.	Large Sugar	do
Justine (Peffer).	Louise bonne de Jersey	Winter.
Jessie, No. 8 (Peffer).	Mannings Elizabeth	Winter.
Kurskaya (392 Budd).	Medviedovka	Blight.
Keiffer.	Mount Vernon	Winter.
Lemon (Kharkoff).	Osband's Summer	Winter.
Lemon (Gibb).	Orel No. 16	Blight.
Longworth.	Peffer's No. 3	Blight.
Le Czar No. 36.	Petit Marguerite	Winter.
Maria (Currant Pear).	Pitmaston's Duchess	do
Mongolian Snow Pear.	Pound	Blight.
Mdme. Chaudy.	Pomeranovka	do
Matilda.	President Drouard	Winter.
Medovia, No. 4.	Ritson	Blight and winter.
Peffer's No. 2.	Red Bergamot	do
Peffer's No. 1.	Sheldon	Winter.
Peffer's No. 7.	Salviate (Ansjutin)	do
Prairie du Pont (from J. Graham, Iowa)	Thin Twig	Blight.
Panna No. 33.	Tyson	Winter.
Princesse No. 3.	Theresa	do
Scented (Mor, No. 109).	Thick Twig	Blight.
Sapieganka.	Ukraine Bergamotte (Niemetz)	do
Sugar No. 9.	Voronesh, No. 28	Blight.
Sutton's Great Briton.	Vicar of Winkfield	Winter.
Seckel.	Voskovaya	Blight.
Summer Belle.	Voronesh No. 102	Blight.
Tonkovietka (Budd).	Vinogradni Bog	do
Vermont Beauty.	Victoria	Winter.
Voronesh No. 18.	Weinbirn	Blight.
Wilmot.	White Leiveland	do
White Doyenne (No. 2 Seedling).	Zoe	Blight.
Winter No. 9 M.		
Zucherbirn (Budd).		

NOTE.—A number of seedling varieties unnamed and unintroduced are not included in this list. Many of these are as yet in nursery row, or as top grafts. See article on blight.

PEARS.

BEURRÉ BALTET.—Grown by Mr. J. D. Roberts, Cobourg, Ont.

Description :—Large pyriform oblique ; skin yellow, flesh mealy, lacking in flavour insipid. Quality poor ; season, October.

BEURRÉ CHAUDY.—Grown by J. D. Roberts, Cobourg, Ont.

Description :—Large, regular pyriform. Skin yellow, slightly russeted near calyx. Stalk stout, calyx open. Flesh white, firm, buttery, quite granular "gritty" near core. Quality good, season, November.

DIRECTEUR ALPHANDE.—Grown by J. D. Roberts, Cobourg, Ont.

Description :—Large, broad at base with a bottled shaped neck (obtuse obovate) deep suture on one side. Skin deep green, rough. Basin russeted, irregular, calyx closed. Stem very large, $\frac{3}{16}$ inches in diameter, $1\frac{1}{4}$ inches long, curved. Flesh white, firm, coarse, poor quality. Season, January or later, Mr. Roberts says "will keep until April or longer and is a delicious baking pear."

PRES. DROUARD.—Grown by J. D. Roberts, Cobourg, Ont.

Description :—Medium to large, obtusely pyriform, angular, green with patches of russet. Stem $1\frac{1}{2}$ inches long set in a broad shallow depression. Basin deep, calyx closed. Flesh white, firm.

THERESA.—Grown by J. D. Roberts, Cobourg, Ont.

Description :—Small roundish ovate, yellow with slight blush towards stalk, cavity wanting ; stalk strongly shouldered, 1 to $1\frac{1}{4}$ inches long, prominent. Basin small, calyx open. Flesh yellow melting, slightly gritty about core. Quality good, sweet. Season, October 15th to November 1st. Stem too much in the way to be a good shipper.

VARIETIES of cherries planted since 1888 (not including unnamed seedlings).

Living.	Dead.	Type.	Cause of death.
Amarelle Bouquet		Morello	
Abesse d'oignies		do	
Amarelle Hâtive		do	
Brusseler Braun		do	
Bessarabian		do	
	Belle Magnifique	Duke	Freezing, sunscalding.
	Black Eagle	Heart	Freezing roots.
	Brown's Best	Mazzard	Freezing, top and stems.
	Bender	Morello	do
	Black Tartarian	Heart	do
Carnation		Morello	
Cerise de Ostheim		do	
Kentish		do	
Cleveland		Bigarreau	
Double Natte		Morello	
Dupuis		do	
Double Glass		do	
	Dyehouse	do	Freezing roots.
	Downer's Late	Heart	Freezing top and stem.
Early Richmond		Morello	
English Morello		do	
	Early Purple	Heart	do
	Empress Eugenie	Duke	Freezing roots, top and stems.
	Elton	Heart	do do
	Esther	do ?	do do
Foûche Morello		Morello	
	Früh Morello	do	Freezing roots.
	Fraundorfer Weichsel	do	do
Griotte de Butner		do	
Gruner Glass		do	
Griotte du Nord		do	
Glaskirk Doppelte		Duke	
Griotte d'Ostheim		Morello	
	Griotte Morello	do	Freezing roots.

VARIETIES of Cherries planted since 1888 (not including unnamed seedlings)—*Con.*

Living.	Dead.	Type.	Cause of Death.
	Gov. Wood	Heart	Freezing tops and stems.
	Griotte Imperial	Duke?	Freezing roots.
	Griotte Precôce	do	Freezing top and stem.
	Galopin	do	do
	Gros Gobet	do	do
Heart Shaped Weichsel		Morello	
June Amarelle		do	
Koslov Morello		do	
	King's Amarelle	do	Freezing roots.
	Knight's Early	Heart	Freezing top and stem.
	Kirtland's Mary	do ?	do
Lithauer Weichsel		Morello	
Lieb		do	
Lutovka		do	
	Late Morello	do	Freezing roots.
	Louise (Chase Bros.)	Duke?	Freezing top and stem.
Mercer		Bigarreau	
Montmorency		Morello	
do Ordinarie		do	
Minnesota Ostheim		do	
	Montmorency Large	do	Freezing roots.
	May Duke	Duke	Freezing top and stem.
	Montmorency Long-que	Morello	do
	Mezel	Bigarreau	do
	Napoleon	do	do
	Niemetz (Seedling)	Morello	Freezing roots.
Ostheim		do	
Orel No. 23		do	
do No. 24		do	
do No. 25		do	
do No. 27		do	
	Olivet	do	Freezing roots.
Riga No. 18		do	
Russian No. 207		do	
	Royal Duke	Duke	Freezing top and stem.
	Reine Hortense	do	do
	Roberts Red Heart	Heart	Freezing roots.
	Rose	Morello	do
	Red Morello	do	do
	Russian No. 2	do	Sunscalding.
	Rockport	Bigarreau	Freezing top and stem.
Strauss		Morello	
Shadow Amarelle		do	
Spate Amarelle		do	
Sand Cherry C.E.F. No. 1.		Prunus pumila	
	Sklanka	Morello	Sunscalding.
	Susse Früh Weichsel	do	Freezing roots.
	Sparhawk's Honey	Bigarreau	Freezing top and stem.
	Tradescant's Black	do	do
Vladimir		Morello	
	Vistula	do	Freezing roots.
	Voronesh, No. 27	do	Sunscalding.
Wagner, Budd		Duke?	
	Windsor	Bigarreau	Freezing top and stem.
	Wragg	Morello	Freezing roots.
	Weir No. 2	Duke	do
	do No. 13	do	do
	do No. 18	do	do
Yellow Sand Cherry		Prunus pumila	

Varieties of Plums planted since 1888. (Not including a large number of unnamed seedlings.)

Living.	Dead.	Type.	Cause of Death.
American Eagle			
Arab			
	Admiral	P. Dom	Freezing top and stem.
	Adirondac		
	Abundance	Japan	do do
Bicksley		P. Am	
Bohemian			
Botan		Japan	
Bonne St. Anne		P. Dom	
Black Hawk		P. Am	
Bradshaw		P. Dom	
	Beauty of Naples	do	do do
	Bleecker's Gage	do	do root.
	Bingham	do	do top and stem.
	Blue Orleans	do	do do
	Black's Purple	do	do do
	Belgian	do	do do
	Briton (Brown)	do	do do
	Bryanston's Gage	do	do do
Colorado Queen		P. Ang.?	
Clinton		P. Am	
Carver		do	
Comfort		do	
Cheney		do	
Chateauguay		P. Dom	
Chabot		P. Chicasa	
Charles Downing		do	
City			
Cottrell			
Champion			
Col. Wilder		do	
	Copper	P. Dom	do do
	Communia	do	do do
	Coe's Golden Drop	do	do do
	Canada Egg	do	do do
	Columbia	do	do do
De Soto		P. Am	
Dr. Dennis		do	
Deep Creek			
Dunlap's No. 1		P. Dom	
do No. 2		do	
do I.X.		do	
	Duane's Purple	do	do do
	Damson	do	do do
	Dame Jaune, 115	do	do do
Forest Garden			
	Fellemberg	do	do do
	Forest Rose	P. Am	Sunscald.
Golden Beauty			
Galem			
Glass Seedling		P. Dom	
Gaylord			
German Prune		do	
Green Gage No. 1 (R.B.W.)		do	
do No. 4 (R.B.W.)		do	
	Gueii	do	do do
	Golden Cluster		
	General Hand	do	do do
	Grand Duke (E. & B.)	do	do do
	Golden Gage	do	do do
Hawkeye		P. Am	
Hungarian		do	
Hunt		do	
Hogg's No. 2			
Hammer		do	
Hoyosomomo		Japan	
	Honey Drop		
Iroquois			
Irene			

VARIETIES of Plums planted since 1888—*Continued.*

Living.	Dead.	Type.	Cause of Death.
Iron Clad			
Idol			
	Ida	P. Am	Freezing root.
	Imperial Gage	P. Dom	do top and stem.
	Isium Ureck, No. 6	do	do root and top.
Jessie		P. Chicasa	
John A		P. Dom	
	James Vick	P. Chicasa	do top and stem.
	Kansas Drawf	do	do root and top.
	Kingston	P. Dom	do top and stem.
	Kenyon No. 1		
	Krasnaya Sklospok	do	do do
Leipsic		do	
Louise			
Lombard Seedling (Saunders)		do	
Lincoln		do	
	Late Red (Fisk)	do	do root.
	Lawrence's Favorite	do	do do
	Lombard	do	do top and stem.
	Luscombs None-such	do	do do
	Latchford	do	do roots.
Massu			
Mankato			
Miner			
Manitoba No. 4		P. Am	
do No. 5		do	
Moreman		do var	
Milton		P. Chicasa	
Mills' Seedling			
Marianna		P. Hort	
	Masters	P. Dom	do roots.
	Munro	do	do top and stem.
	Maquoketa	P. Chicasa	Sunscald, freezing.
	Magnum Bonum	P. Dom	Freezing top and stem.
	Montmorency Beauty	do	do do
	Moldavka	do	do roots.
	Mdlle Blanche Saumer	do	do top and stem.
Nicholas		do	
Nelly			
Nebraska			
New Ulm			
	Niagara	do	do do
	Niemetz	do	do roots.
	Nota Bene (Brown)	do	do top and stem.
	Newman (E. & B.)	do	do do
Ocheeda			
Orel No. 20		do	
Otschakoff (Fisk)		do	
	Ogon	Japan	do do
	Orange (E. & B.)	P. Dom	do do
Peffer's Premium			
Prairie Flower			
Pond's Seedling		do	
	Pottawattamie	P. Chicasa	do root and top.
	Prince Englebert	P. Dom	do top and stem.
	Prunus Simonii	Japan (hybrid)	do root, top and stem.
	Postmaster	P. Dom	do top and stem.
	Prune d'Agen	do	do do
	Peach Plum	do	do do
Quaker			
Quebec		do	
	Quackenboss	do	do do
Rockford		P. Am	
Reine Claude		P. Dom	
Reed			
Richland		do	
Rollingston		P. Am	
Richard Trotter		P. Dom	
	Russian No. 19	do	do do

VARIETIES of Plums planted since 1888—*Concluded.*

Living.	Dead.	Type.	Cause of Death.
	Riga No. 113	P. Dom	Freezing root.
	Red Winter, B.		do top and stem.
	Robinson		do do
Silas Wilson			
Sneiling		P. Am. var	
Speer		P. Am	
Stoddard		do	
Sophie		P. Dom	
	Shropshire Damson	do	do roots, top and stem.
	Shipper's Pride	do	do top and stem.
	Smith's Orleans	do	do do
	Sweet Water	do	do do
	St. Lawrence, (E. & B.)	do	do do
Trabische		do	
Ungarish		do	
Voronesh (Fisk)		do	
Vorenesh Yellow (Budd)		do	
Vanburen		P. Am. var.	
Voronesh No. 102		P. Dom	
do No. 20		do	
Van Deman			
Victoria		do	
Whitacker			
Wolf		P. Am	
Wyant			
Weir's Large Red		do	
Washington		P. Dom	
Weaver		P. Am	
	White Otschakoff	P. Dom	do roots.
	Wangenheim, (E. & B.)	do	do top and stem.
Yosemite Purple		P. Am	
do Yellow		do	
Yellow Sweet			
	Yellow Egg	P. Dom	do do
	do Gage	do	do do

SEEDLING FRUITS.

I am pleased to report an increased interest on the part of owners of seedling fruits in bringing these to public notice, for the purpose of ascertaining their particular features of usefulness with a view of introducing them if thought sufficiently valuable. In continuation of the work begun two years ago, a considerable number of varieties have been received and examined this year; where thought worthy they were described in detail and scions were asked for. In most instances growers have furnished these without hesitation, always being assured that their distribution would be restricted to the various experimental stations until permission was given by the grower.

In this connection I may be allowed to urge upon persons sending in these seedling fruits the necessity of wrapping each specimen in paper and inclosing them in a strong cardboard box, a history and description of the tree with the name of the sender and that of the owner or introducer should accompany each package, or be inclosed with the fruit. A number of packages have been received without anything but the post mark, and sometimes minus that, to identify them. This leads to confusion and enhances the labour of recording the necessary data. Suitable mailing boxes will be furnished on application by the Horticultural Division, Central Experimental Farm, Ottawa, to those who wish to forward samples of seedling or other fruits for examination. It is also desirable to send six specimens in each case, so that they may be distributed to three members of the committee of the Fruit Growers'

Association of Ontario, on new fruits. Information regarding the fruits received is given in condensed form in the following tabular statement. Where thought worthy a fuller description is appended.

SEEDLING APPLES.

Record Number.	Sender. Province.	Sender. Name.	Remarks.
100	* P. E. Island.....	Gill, John H., Little York....	Medium to large; yellow; flesh juicy, with a peculiar quince flavour.
101	do	Ward, W. M., Uptown	Three distinct seedlings; not valuable.
102	New Brunswick...	Williams, B., Long Reach.....	Medium size, round; yellow; winter.
103	* Quebec..........	Dart, Rev. W. J., St. Lambert	Northern Spy seedling; much resembles parent in appearance and quality; winter.
104	Quebec	Frazer, John, Coaticooke.... .	Small size, round; red; winter.
105	do	Herrick, J. E. K., Abbotsford.	"Herrick." Good for cooking only; keeps well; mid.winter.
106	* Quebec..........	do do ..	"Bangle." Medium size, handsome; fair quality; early winter.
107	Quebec	La Trappe, Oka..............	No. 1, medium size; poor quality.
		do	No. 2, small, crimson; winter.
		do	No. 3, small, yellow; long keeper; cooking.
108	*Ontario..........	Allan, A. McD., Goderich.....	"Williams." Small, compact; acid, juicy; late winter.
109	do	Burgess, Amos., Bala	Crab; good size, handsome; September.
110	* do	Clare, R. P., Rideau Centre...	Medium size; yellow; firm; good winter.
111	do	Fisher, M. J., Maxville.......	"Sir Oliver." Red, juicy; fair quality; resembles "Gravenstein" in appearance and season. Medium size.
112	do	Graham, I. J., Vandeleur... .	Medium to large; green; firm; acid; winter.
113	do	do do	Medium size: red; poor quality; autumn.
114	do	Greenfield, S., Ottawa East....	Large; red; poor quality.
115	do	do do	No. 2, small; yellow; good winter.
116	* do	do do	No. 4, medium; yellow; good winter.
117	do	do do	Medium; yellow; poor quality; winter.
118	do	Kerr, W. J., Renfrew.........	"Knight's Russet." A small, sweet, white fleshed russet; may be locally valuable; autumn.
119	do	do	"Knight's No. 1." Resembles St. Lawrence; two or three weeks later; handsome; fair quality; autumn.
120	do	do	"Fraser's No. 1." Small; poor quality; autumn.
121	do	do	Seedling; Blue Pearmain type; worthless.
122	do	Leef, W. H., Orillia......	Large, green; poor quality.
123	do	Lowrey, E. D., St. Davids ...	Small; said to be a crab; September.
124	* do	Morse, S. P., Milton..........	Medium to large; yellow; quality, best; promising; probably a seedling of early harvest. Early summer.
125	* do	do	Medium to large; oblate; red, sweet; late winter.
126	do	McConnell, H. L., Grovesend .	Medium size; crimson; good quality; winter.
127	* do	Ramer, John H., Markham ...	Medium size; yellow; good quality; not attractive; good keeper.
128	do	Roberts, C. H., Paris	"Ridgemount." Medium size; sweet; summer; not good enough to compete with "Duchess."
129	do	do	"Allan Ridgemount." Medium; yellow; fair; mid-winter.
130	* do	Williamson, W. P	Small; oblate; yellow; good; mid-winter.

* More complete description follows.

PLUMS.

Record Number.	Sender. Province.	Name.	Remarks.
131	* Nova Scotia.....	McFarlane, D. H., Pictou.....	Seedling of White Magnum Bonum. Good quality; season, late September.
132	do	do do ...	Seedling of White Magnum Bonum. Blue; nearly free; fair quality.
133	Ontario.	Ruth, S., Ridgetown..........	Blue; size of Lombard; cling; late August.
134	* do	Smith, A. M., St. Catharines..	"Smith's October. Medium size; nearly black; cling; fair quality; October.
135	do	Stephens, C. L., Orillia.......	Seedling, native red; good quality.
136	Manitoba	....	9 samples; native Manitoba plum; Nos. 1 to 3 worthy of propagation in Manitoba.

PEACHES.

137	* Ontario	Bruner, M. G., Olinda........	"Corlett." Medium; pink, yellow, free; end of July.
138	do	Whaley, M., Olinda..........	"Ermine." Medium; partially free; pit large; ripe first week August.

GOOSEBERRIES.

139	Ontario.....	Stephens, C. L., Orillia........	Medium size; white; fair quality; July 10.

CURRANTS.

140	Ontario.....	Stephens, C. L., Orillia........	Red Dutch type, but sweeter; July 10.

* More complete description follows.

Record No. 100. Apple, seedling. Received Nov. 11, 1896.
From John H. Gill, Little York, P.E.I.

Description.—Medium or above, oblong, slightly conical obscurely five-sided. Skin glossy, green with a pinkish blush on one side. Cavity broad moderately deep; stem $\frac{3}{4}$ to 1 inch long stout, unusually thickened at base, curved. Basin, shallow wrinkled; calyx end large, closed. Flesh white, crisp, juicy, but not melting with a pronounced quince like flavour, peculiar but pleasant, core large open. Season mid-winter or later. Worth propagating on account of good quality and keeping properties. Resembles in flavour—so says Dr. Fletcher the English Quince pippin. Scions have been received for grafting.

Record No. 103. Apple. Received Nov. 11, 1896.
From Rev. W. J. Dart, St. Lambert, Que., said to be a seedling of Northern Spy.

Description.—Medium or below, roundish conical Northern Spy form with the same ribbings more or less distinct. Skin thick, dull crimson in colour diffused. Cavity broad, deep regular; stem long, stout. Basin small, shallow. Flesh yellow, firm, crisp, almost identical with Spy in character and flavour. Season, winter. Mr. Dart says: "the specimens were grown by Mr. John Duckworth, Grand Trunk Railway bridge inspector. He says that 10 or 11 years ago he planted some seeds from a Northern Spy apple. One of the trees so produced has never been grafted and bore the

apples forwarded. The fruit is very much like Northern Spy in colour, in shape and texture. The tree is quite hardy here at St. Lambert, never having been winter killed. It stands in a rather sheltered garden about half a mile from the banks of the St. Lawrence." Scions asked for.

Record No. 106. Apple, seedling. Received Nov. 16, 1896.

"Bangle," from J. E. K. Herrick, Abbotsford, Que.

Description.—Large, oblate, smooth and regular, skin tough, greenish yellow in colour; nearly covered with light stripings and blotchings. Cavity, broad, deep, sometimes russeted; stem slender ½ to ¾ of an inch long. Basin small, round; calyx partly closed. Flesh yellowish white, with a distinct St. Lawrence like flavour; texture inclined when fully ripe to be mealy; slightly lacking in juice and sprightliness. A chance seedling now about 25 years of age growing in the garden of the Bangle farm, Abbotsford, Que. Tree hardy, round topped. A heavy alternate bearer. Probably a seedling of St. Lawrence and named by Mr. Herrick after the original owner of the farm. Worthy of trial in a limited way.

Record No. 108. Apple, seedling. Received October 10, 1896.

"Williams," from A. McD. Allan, Goderich, Ont.

Description.—Small roundish conical. Skin yellow, with light pink stripes on one side. Cavity very shallow, almost wanting; stem short ⅜ to ½ inch with a prominent terminal knob. Basin shallow, slightly wrinkled. Flesh yellowish white, firm, crisp, very juicy, acid and aromatic. Fair, core small, season, late winter; rather promising for home winter use on account of compactness of form and pleasant acidity of flesh, but is not sufficiently attractive or large enough for export purposes.

Record No. 109. Crab seedling. Received September 20, 1896.

Forwarded by J. P. Cockburn, Gravenhurst, Ont. Grown by Amos Burgess, Bala, Muskoka, Ont.

Description.—Size, longitudinal diameter, 2 inches, lateral diameter, 1¾ inches. Form roundish, oblate regular. Skin glossy, bright scarlet in colour, Siberian type. Stem 1½ inches long. Flesh firm, crisp-juicy, slightly astringent. Season, end of August. Said to be very productive. Like other crabs, useful for culinary purposes. Scions received.

Record No. 110. Apple, seedling. Received October 10, 1896.

"Joe Pattie." From R. P. Claire, Rideau Centre, Ont.

Description.—Medium to large roundish, slightly conical. Skin smooth, glossy yellow, partly covered with a bright red blush. Cavity entirely wanting in some specimens; stem stout, 1 inch long, obtrusive; its most objectionable feature. Basin deep, narrow, calyx closed. Flesh white, firm, fine-grained, very juicy, acid good. Season mid-winter. Locally known by the name of "Joe Pattie." Season, late winter. Mr. Claire says: "The seedling originated on the farm of Mr. Pattie between L'Orignal and Vankleek Hill. The tree is a fair annual bearer, a very thrifty grower, perfectly hardy, but its chief point of merit is its keeping qualities. In our cellar it keeps perfectly till April or May." Scions received.

Record No. 114. Received March 4, 1896.

Apple seedling. From S. Greenfield, Archville, Ont.

Description.—Medium size, conical. Skin yellow, with light red stripings. Cavity small; stem short. Basin small, smooth, calyx, closed. Flesh yellow, firm, juicy, sprightly, sub-acid, good, with Roxbury russet flavour. Appears to be worthy of further trial locally.

Record No. 124. Received August 14, 1896.

Apple seedling. S. P. Morse, Milton, Ont.

Description.—Large, round; smooth, regular; skin, a clear, glossy yellow, bearing numerous more or less distinct black dots; cavity, broad, sloping rapidly; stem, medium length, ⅝ to 1 inch; basin small, round, smooth, calyx, open; flesh, white, firm, grained, tender, melting, juicy and buttery, pearlike in character, with pleasant aroma; quality, best.

Mr. Morse says: "I take it to be a chance seedling of Early Harvest, because the tree sprang up not far from one of that variety, which it very much resembles in many points, but is more vigorous—fruit much larger, finer in texture, of better form and more exempt from *Fusicladium*. It is here pronounced the best of all the harvest apples."

This variety appears to be worthy of careful and extended test. Scions received.

Record No. 125. Received October 29, 1896.

Apple seedling, No. 3, from S. P. Morse, Milton, Ont.

Description.—Slightly above medium, flat, conical, regular. Skin smooth, not oily, green, partly covered at base with light to dark red, diffused or in stripes, bearing numerous small dots. Cavity, smooth, broad, sloping, deep, lined with green or russet; stem, $\frac{7}{8}$ to $1\frac{1}{4}$ inches long, fairly stout. Basin, small, shallow. Calyx, small, partly open. Flesh, white, crisp, juicy, nearly sweet, melting, very pleasant, good; core small; seeds, large and plump; season, mid-winter. Appears to be worthy of local trial as a sweetish winter apple.

Mr. Morse says: "Tree like the Spy, finely fastigiate, very vigorous. It has no marked excess of those small spray-like twigs that infest the growth of the Spy and produce most of the worthless fruit. The crop is produced mainly on the wood of last year's growth. * * Very productive. * * Holds well to the tree."

Record No. 126. Received September 15, 1896.

Apple seedling, from A. L. McConnell, Gravesend, Ont.

Description.—Medium size, round, remarkably spherical and regular. Skin covered with a rich crimson, thickly marked with large white dots: very handsome. Cavity almost wanting; stem short, $\frac{1}{8}$ to $\frac{1}{4}$ inch long. Basin shallow, only a slight depression; calyx open. Flesh white, fine grained, juicy, melting, sub-acid; good. Season, early winter.

Mr. McConnell says: "I send small and imperfect specimens of a seedling grown by myself. Tree remarkably strong and symmetrical, bears annually. Fruit not affected by 'scab.' Very uniform in size and shape." Worthy of trial.

Record No. 127. Received April 30, 1896.

Apple seedling. From John H. Ramer, Markham, Ont.

Description.—Size above medium, roundish oblated, tapering rapidly towards basin. Skin rough, golden yellow, marked with russet coloured dots, and blushed with light red towards calyx end. Cavity medium; stem $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long. Basin marked by a slight depression, calyx closed. Flesh white, flaky, juicy, mild, sub-acid. Quality good at this season. Apple not attractive, but regular in form and good in quality, besides being a keeper. Mr. Ramer says: "The tree was planted in 1823 by my father, Peter Ramer, who set out nearly 300 seedlings on three acres of ground. The trees were grown from seed brought, I think, from the States, and no two bore the same kind of apples. The tree is a heavy annual bearer." Worthy of local trial.

Record No. 130. Received January 20, 1896.

Apple seedling. From W. J. Williamson, Port Nelson, Ont.

Description.—Small, oblate. Skin yellow, nearly covered with crimson stripes and splashes. Cavity, deep and russeted; stem slender, short. Basin shallow; calyx open. Flesh yellow, crisp breaking, very juicy, pleasant, good. Season, mid-winter. Worthy of local trial.

Record No. 131. Received September 28, 1896.

Plum seedling. From D. H. McFarlan, Pictou, N.S. Seedling of white magnum bonum yellow egg.

Description.—Medium to large egg-shaped, tapering towards stem. Suture plainly marked, but not deep. Stem, $1\frac{1}{4}$ inches long, set in a moderately deep cavity, fairly stout. Skin greenish yellow, thinly covered with light lilac bloom, with some mottling. Flesh yellow, firm, good quality, closely adherent to stone. Stone small, flat, one-sided, hollowed near wing, sub-acid. Quality, good. Season about middle of September. Mr. A. McD. Allan says: "With us it would scarcely have a place for introduction owing to the fact that it is about the same season as Coe, and scarcely as large in size, but it may be valuable for other sections if the tree has hardiness to recommend it."

Record No. 134. Received October 4, 1896.

Plum seedling. "Smith's October." From A. M. Smith, St. Catharines, Ont.

Description.—1⅝ inches longitudinally and laterally. Slightly one-sided; suture obscure. Colour nearly black with light blue bloom, some mottling. Flesh dark yellow, firm, sub-acid, cling. Fair quality. Stone small, globular, with deep hollow along side a thickened margin. Mr. A. McD. Allan, of Goderich, Ont., says: "There are many seedlings in this section of this class, but owing to the fact that like this they are under size, and not possessing any distinguishing points to recommend them specially, I have never brought them to notice. * * * Coe is as late as I have found value for a plum, and I would be inclined to pass anything late, unless it was large and a good cooking plum with free stone." I am inclined, however, to think this variety worthy of local trial.

Record No. 137. Received July 27, 1896.

Peach seedling "Corlett." From M. G. Bruner, Olinda, Ont.

Description:—Size two inches longitudinally, by 2½ laterally—nearly round, regular. Suture shallow extending half the length. Skin yellow, partly covered with a pink blush, deepest near cavity. Stem set in a deep narrow cavity. Flesh pale-yellow, moderately firm, juicy, sweet, good. Stone medium size, free. Worthy of local trial. Mr. Bruner says: "The tree is a strong grower, produced by Mr. Corlett, of Olinda, resembling in form Amsden June."

KEEPING PROPERTIES OF APPLES.

Twenty-five varieties of apples were taken from an earth cellar, where they had been placed after harvesting, and placed in the cellar of the Horticulturist's house early in December, 1895. The temperature of the cellar ranged between 35° and 40° F. for three months, with the exception of a short time during an unusually cold snap in January, when the temperature fell to 26° F., or 6° below freezing. The apples at this time were undoubtedly frozen, but were in the dark and thawed out slowly. The temperature was very uniform afterwards until April 15th, when it reached 45° F. During May it rose a little higher. The apples were not wrapped in paper, being simply packed in boxes or baskets of sufficient capacity to hold the quantity of fruit in each instance. They were examined carefully on May 28th, and notes made of the number of sound, partially decayed and completely rotten specimens of each variety. The results are given below in percentages of each grade, varieties ranged in order of merit, as shown by their keeping properties:—

Variety.	Percentage Sound.	Percentage Partly Decayed.	Percentage Rotten.
Ben Davis	100	......	......
Orange Winter	93	7	......
Wagener	88	......	12
Rawles Janet	82	6	12
Wine Sap	82	4	14
Walbridge	73	13	13
Green Sweet	72	11	16
Crimean	62	15	23
Lawver	49	11	40
Bombarger	44	36	20
Duke of Connaught	42	16	42
Hardy	34	33	33
Swayzie Pomme Grise	31	6	63
Pewaukee	20	47	33
Watterson No. 3	20	40	40
Salome	20	40	40
Fameuse	12	18	70
Quaker Beauty	4	......	96
Hardisty	......	25	75
Haas	......	......	100
Gideon	......	......	100
McIntosh Red	......	......	100
Anisovka	......	......	100

ROOT KILLING OF FRUIT TREES.

It is not often in Eastern Canada that the roots of the hardier classes of tree fruits are injured or killed by frost. The accustomed heavy winter covering of snow prevents, as a rule, the frost from penetrating to a dangerous depth, by preserving the natural warmth of the soil. Occasionally, however, a period marked by low temperatures arrives in advance of the snow covering, bringing with it sure death or surer injury, to roots unprotected. The greatest damage usually occurs to trees on dryish sandy soils. In such situations the frost penetrates readily and its action is attended with graver results on account of light soils being more sensitive to sudden changes of temperature. The action of the frost in this instance would be analogous to that described in discussing its effect upon the cells, composing the branches and twigs of trees.

Speaking of injury of this kind, Prof. Hartig, University of Munich, says :—

"Roots of all young trees—even forest trees, may be killed if severe and long continued frost finds the lighter classes of soil unprotected by snow or any other covering. The periderm of the roots is thinner than on the stem and consequently the former are less protected and, moreover, growth is active for a longer period in roots. In mild climates, it continues till the middle of winter, so that when frost occurs the tissues are not in the inert condition which assist them to resist cold. Such plants burst their buds in spring, but wither up whenever transpiration from the delicate young shoots has exhausted the stock of water." An occurrence of this kind may wipe out in a single winter what was a promising young orchard. As the trees grow older and become deeper rooted, the danger naturally lessens. Portions of the Central Experimental Farm cherry and apple orchards upon light soils under clean cultivation were almost totally destroyed in this way last winter. The temperature fell and remained at 20 degrees below zero for some days towards the end of December, when the ground was entirely unprotected by snow. The cherries were mainly root grafted or budded on Mahaleb stock, the apples were budded and grafted on French crab stocks. The character or variety of stock seemed to have less to do with the extent of the injury than the nature of the soil. In those portions of the orchard where a hard and impervious subsoil approaches the surface the injury was greatest. The twigs and branches retained their plumpness till the commencement of vegetative process; the flower buds, with which the trees were thickly covered, opened or partly opened, as the case might be, and in some instances fruit set; the leaf buds usually made an attempt to do their duty, but failed to more than half develop leaves. By this time the twigs were much shrivelled, and the store of food having become exhausted the trees gave up the struggle and died. On digging them up, it was found that in nearly every instance the upper system of roots was entirely killed and while the lower or tap roots were alive towards their lower extremities, the superior portions were completely destroyed. A lesson of this kind need only be learned once, and strongly emphasizes the desirability, if not necessity, of surface protection from that standpoint.

One of the best means of guarding against this danger is discussed under the head of *Orchard Cover Crops;* another way may be suggested under the head of *Hardy Stocks.* It is unwise to expect that either or even both of these preventives will always be effectual; they are, nevertheless, the best means to the end desired. There are a number of unsettled questions relating to the effect of stock on scion and vice versa. In the case of budded and root-grafted trees, nurserymen well know that when a variety of apple tree has reached three years of age in the nursery row, no matter what class of root has been used in propagating it, whether budded or grafted, the roots of the salable nursery trees will all resemble each other and will collectively represent a type characteristic of the variety propagated. This may be exemplified by a deep rooting habit, a shallow rooting habit or by having a large number of small, fibrous roots in contradistinction to a few large branching roots. These differences are characteristic of the habit of the variety represented by the scion used in grafting. These may be termed physical differences. Whether a similar constitutional change is wrought in the stock is a question that is not settled, so far as I am aware, at the present time. It seems reasonable to suppose that the virility of the stock would undergo modification in a degree coördinate with its physical transformation. If so, root-grafting as a means of

increasing the root hardiness of tender varieties would not be as effectual as might at first thought be expected. By what is known as "double working" there is reason to believe the desired end might be more completely attained. A "double worked" or double grafted tree is one which has been propagated by root-grafting or budding and has subsequently, when it has reached the proper size, at three or four years of age, been itself top-grafted in the main branches, or in the stem at a point just below where branching took place. In this way stocks of a certain character are formed, and upon them are placed other varieties wanting, in desirable qualities. It may be asked, will the scions placed upon these trees modify and finally dominate the stock to such an extent as to eventually effect a complete transformation into its own constitutional likeness. It is probable that a gradual change will take place, but the opposing forces, if we may so term them, being at the beginning in favour of the stock, the change, if any, may presumably be expected to take place slowly.

Top Grafting Stocks.—Among the Russian varieties and Siberian crab hybrids there are a number which will undoubtedly prove valuable for this purpose. The following are being tested: Romna, Hibernal, Gideon, McMahan White and Haas. They are strong growers and characteristically deep rooted.

The following is a list of apple and cherry trees destroyed by root killing last winter:

CHERRIES.

Variety.	Stock.	When Planted.	Number of Trees Killed.	Remarks.
Amarelle Hâtive	Mahaleb	1891	1	Roots entirely killed.
do Boquet	do	1890	4	do partly killed.
Abesse D'Oignes	do	1890	2	do do
Bessarabian	Mazzard	1891	3	Upper part of roots killed.
do	Mahaleb	1888	2	do do
Bender	do	1891	1	Roots alive at extremities.
Black Eagle	Mazzard	1891	2	Roots entirely killed.
Double Natte	do	1888	2	do
Dyehouse	Mahaleb	1890	2	do
Downer's Late	Mazzard	1891	1	Roots partly killed.
Early Purple	do	1891	1	Roots alive at extremities.
Elton	do	1891	1	Roots partly killed.
Early Richmond	Mahaleb	1888	2	Roots killed at base of tree.
Fouche Morello	Mazzard	1890	1	Roots entirely killed.
Frauendorfer Weichsel	do	1888	1	do
Griotte Morel	do	1891	1	do
do de Butner	do	1892	1	do
do Impériale	Morello	1888	1	do
do do	Mahaleb	1890	1	do
do d'Ostheim	do	1888	1	Roots partly killed.
do du Nord	do	1894	3	do
Gruner Glas	do	1891	2	Roots entirely killed.
Glaskirche Kurtz	do	1891	2	do
Governor Wood	do	1891	2	Upper part of roots killed.
King's Amarelle	do	1894	3	Roots partly killed.
*Koslov Morello	Own root	1890	2	do
Kentish	Mazzard	1888	1	Roots entirely killed.
Knight's Early	do	1891	1	do
Lutovka	do	1891	3	do
Late Morello	Mahaleb	1888	2	do
Lithauer Weichsel	do	1894	3	Roots killed at base of tree.
Montmorency, large	do	1891	2	Upper parts of roots killed.
do	do	1888	2	Roots killed at base of tree.
Moscow, No. 12	do	1891	2	Roots partly killed.
do 62	do	1894	2	Roots entirely killed.
Morello Früh	do	1888	1	Roots partly killed.
May Duke	Mazzard	1891	2	Roots entirely killed.
Napoleon	Mahaleb	1891	2	do
Olivet	do	1888	2	do
Ostheim	do	1888	21	do
Orel, No. 24	do	1891	3	do
do 27	do	1894	1	do
do 27	do	1890	1	do killed above only.
do 25	do	1888	1	do

*Two trees out of twenty killed.

CHERRIES—*Concluded.*

Variety.	Stock.	When planted.	Number of Trees Killed.	Remarks.
Orel, No. 23	Mazzard	1894	3	Roots entirely killed.
Red Morello	do	1888	1	do
Roberts' Red Heart	do	1891	1	do
Rose	Morello	1888	1	do
Schatten Amarelle	Mazzard	1888	3	do
Süsse Früh Weichsel	Mahaleb	1890	1	Roots alive at extremities.
Spate Amarelle	do	1894	3	Roots entirely killed.
Strauss	do	1888	1	do
Vladimir	do	1889	3	Lower part of roots alive.
do	Mazzard	1890	3	Roots entirely killed.
Vistula	do	1888	1	do
Wragg	Mahaleb	1888	1	do
Weir, No. 18	do	1888	1	Roots partly killed.
do 12	do	1888	1	do
do 13	do	1890	1	Roots alive at extremities.

PLUMS.

Bryanston's Gage	Myrobolan	1888	1	Roots entirely killed.
Bleecker's Gage	do	1890	1	do do
Belgian Purple	do	1888	1	Lower extremities of roots alive.
Bonne Ste-Anne	Own roots	1895	1	Roots entirely killed.
Chas. Downing	Myrobolan	1893	1	Extremities of roots alive.
Comfort	do	1892	1	Roots entirely killed.
Dunlop, 1. X	Own roots	1893	2	do do
Damson	do	1888	1	Upper part of roots alive.
Dunlop, 2. X	do	1893	2	Roots entirely killed.
De Soto	Myrobolan	1888	1	do do
do seedling	Own roots	1895	4	do do
Early Red	do	1890	1	do do
Early Damson No. 2	do	1895	1	do do
Green Gage No. 3	do	1893	2	do do
do No. 4	do	1893	2	do do
Gamache	do	1893	1	do do
Hawkeye	Myrobolan	1890	2	do do
Ida	do	1890	2	do do
Isium Ureck	do	1893	1	do do
John. A	do	1895	1	do do
Kansas Dwarf	do	1888	2	Upper part of roots killed only.
Lawrence's Favourite	do	1890	1	do do
Late Red	do	1888	3	Lower extremities of roots alive.
Latchford	Own roots	1895	3	Roots entirely killed.
Leipsic	P. Americana	1893	1	do do
Moldavka	Myrobolan	1888	2	Roots alive below.
Marianna	do	1888	1	do do
Masters	...	...	...	
Niemetz	P. Americana	1895	2	Roots entirely killed.
Nicolas	...	1888	2	Roots alive at lower extremities.
do White	...	1888	2	Roots entirely killed.
Orleans Blue	Own roots	1891	2	do do
Orel No. 27	Myrobolan	1890	2	do do
Otschakoff	do	1888	1	do do
Pottawattamie	do	1890	1	do do
Pond's Seedling	do	1888	1	do do
Quebec	Own roots	1895	2	do do
Riga No. 113	Myrobolan	1890	1	Lower extremities alive.
Rollingston	do	1888	4	Roots entirely killed.
Reine Claude (de Montmorency)	P. Domestica	1890	2	do do
R. B. W. No. 1	Own roots	1895	2	do do
Shense (apricot)	do	1894	3	do do
Snelling (P. Am)	do	1895	2	do do
Voronesh	...	1888	1	do do
Wyant	Myrobolan	1890	2	do do
Wyant Seedling	Own roots	1891	2	do do
Wolf	do	1892	2	do do
do	Myrobolan	1888	2	do do
Yosemite Purple	do	1890	2	do do
Yellow Egg	do	1888	1	do do

APPLE AND CRAB TREES, ROOT GRAFTED OR BUDDED MOSTLY ON FRENCH CRAB STOCKS.

Variety.	When planted.	How propagated.	Number killed.	Remarks.
Arabka	1888	Root grafted	3	Lower roots killed first.
American Pippin	1888	Budded	1	Roots gradually killed off.
Ananasnoe	1888	Root grafted	2	Shallow roots all dead.
Avenarius	1888	Budded	1	do do
Champagne	1888	Root grafted	1	do do
Antonovka	1888	do	1	Lower roots previously killed.
do	1888	Budded	1	Lower roots alive.
Beresinskoe	1888	do	...	Lower roots previously killed.
Bombarger	1888	Root grafted	...	Killed near the surface of the ground.
Bethel	1888	Budded	...	do do do
Borovinka	1888	do	...	Shallow rooted.
Cooper's Market	1888	do	1	Roots shallow; all killed.
Coral (crab)	1888	do	2	Roots deep; lower part alive.
Cinnamon	1888	Root grafted	1	Roots shallow; killed.
*Duchess	1888	Budded	4	Roots shallow; completely killed.
Dartmouth (crab)	1888	do	1	Roots shallow; all killed.
Fonaric	1888	do	1	Roots largely decayed.
Gravenstein	1888	do	1	Shallow rooted; a few living from stem.
Grandmother	1888	Root grafted	1	Lower parts dead; a few from stem liv'g.
Golden White	1888	do	1	Lower parts alive; killed at base.
Hibernal	1888	Budded	1	Upper roots and stem healthy; lower dead.
Imperial Citron	1888	Root grafted	1	Surface rooted.
Keswick Codling	1888	Budded	1	Surface part of roots killed.
Kara-synap, B.	1891	Top grafted on Wealthy	1	Roots deep; upper part killed.
Koursk Annis	1888	Root grafted	1	Lower roots killed first.
Louis	1888	Budded	1	Lower roots alive.
Mana	1888	do	1	Lower part of roots alive.
Melonen	1888	Root grafted	1	Surface rooted; all dead.
Martha	1888	Budded	3	Surface roots all killed.
Mottled Annis	1888	do	1	do do
Northern Spy	1888	do	1	Roots killed to a depth of 12 to 16 inches.
Ostrekoff's Glass	1888	do	1	Lower roots alive.
Orange Winter	1888	do	...	Upper series of roots entirely killed.
Primate	1888	do	1	Roots killed to a depth of 12 to 15 inches.
Pewaukee	1888	do	2	Roots shallow; lower system wanting.
Pear Apple	1888	do	2	Deep rooted; lower parts alive.
Possart	1888	do	1	do do
Pointed Pipka	1888	Root grafted	1	Lower roots killed first.
Richard's Graft	1888	do	1	Lower parts of roots alive.
Riga Transparent	1888	do	1	A few roots from stem of tree alive.
Rosy Repka	1890	do	1	Roots shallow; all killed.
Revel Borsdorf	1888	Budded	1	Roots deep; lower parts alive.
Red Annis	1888	do	1	do do
Seek-no-Further	1888	do	1	Roots entirely destroyed.
Saxton	1888	do	1	Roots killed to a depth of 12 to 15 inches.
Stettiner Red	1888	do	1	do do do
*Tetofsky	1888	do	3	A few roots living above stock; extremities all dead.
Thaler	1888	Root grafted	1	Surface roots all killed.
Titovka	1888	Budded	1	do do
Ukraine	1888	do	1	Roots alive at extremities.
Van Wyck (crab)	1888	do	1	Upper part of roots killed only.
Vargulek	1888	do	1	Shallow roots all dead.
Voronesh Reinette	1888		1	Deep roots; lower parts alive.
*Wealthy	1888	Budded	5	Roots destroyed near surface of ground.
Whitney (crab)	1888	do	1	Roots entirely destroyed.
White Astrachan	1888	do	1	do do
White Pigeon	1888	do	1	do do
White Naliv	1888	Root grafted	1	Lower roots previously killed.
Yellow Arcad	1888	Budded	1	Lower roots alive.
Yellow Transparent	1888	do	1	do do

*Killed, out of 25 to 30 trees.

DEDUCTIONS.

It would appear that both root grafted and budded trees suffered severely if not quite to the same extent. Budded trees usually give a stronger and better distributed system of roots at four or five years of age. When these are injured by frost, it is the upper portion immediately in contact with the tree that is most affected. The root grafted tree is characterized by a smaller quantity of root fibres. The lower parts of the roots have, in a great many instances, in fact in the majority of cases, been injured first by frost. Some trees lost the seedling stock completely, two or three years ago but continued growing, being supported by the roots emitted from the one time scions, but now collar of the tree. It was found, however, that these roots were occasionally killed the succeeding winter. Such was not an unusual occurrence, indicating that while the roots from the scion were hardier, as a rule, than the seedling, yet, even though the stock was perfectly hardy, its roots might be injured, or killed when unduly exposed. This same result may be noted in connection with seedling plums of *P. Americana* type, and with named varieties of this class upon their own roots. We are thus warned that orchard cover crops are essential to success in northern orcharding.

ORCHARD COVER CROPS.

Suitable cover crops to protect orchards are of great importance in all fruit-growing sections. In northern regions, the practice of sowing a crop after cultivation ceases, that will at once enrich the soil and protect the feeding roots of the trees, is one of the essentials towards success, and an item in the annual programme of orchard management that should never be omitted. The late P. C. Dempsey, of Trenton, recognized the truth of these statements years ago, and frequently expressed himself to the effect that a cover crop of weeds in the autumn was far better—considered in the light of what was best for the trees—than no cover crop at all. The healthy and profitable orchard of apples and pears which he left to his worthy son W. H. Dempsey, of Trenton, furnishes ample proof of the benefits of the system.

What the meaning of a Cover Crop is—In brief, it means sowing such a crop in the orchard after cultivation ceases in summer, as will protect the roots of the trees by preventing at once alternate freezing and thawing, and deep freezing of the ground; that will add something—the more the better—to the fertility of the soil when turned under; that will improve its tilth or mechanical condition, and, lastly, that will occupy the ground to the exclusion of such plants as may wander out of place—weeds. When soils, especially those of a clayey nature, are constantly cultivated without being subjected to the ameliorating influences induced by producing some kind of vegetation, not only do they become mechanically unfitted for the production of healthy and vigorous plant growth, but the plant food may take on forms not readily assimilable by plants. In northern sections, perhaps the strongest reason that can be urged in favour of the practice is the protective influences cover crops exert against the often severe root injury wrought by sharp frosts to trees growing upon bare soil.

Cover Crops tried—In 1895 a number of plants were tried with a view of ascertaining some facts regarding the advantages of each in this climate, for the purposes outlined above. Half an acre each, of the following fodder plants were sown on Aug. 15th, with a seeding of rye, at the rate of one and a quarter bushels per acre.

No. 1.	Crimson Clover	20 lbs. per acre.
No. 2.	Mammoth Clover	12 "
No. 3.	Alsike Clover	12 "
No. 4.	Alfalfa	15 "
No. 5.	Common Red Clover	12 "
No. 6.	White Clover 6 lbs. and Orchard Grass 14 lbs.	"
No. 7.	Alsike Clover 8 lbs. and Orchard Grass 14 lbs.	"
No. 8.	Crimson Clover 10 lbs. and Orchard Grass 14 lbs.	"
No. 9.	Pease	2 bushels per acre.

The following notes show the condition of these crops late in the autumn of the same year and early in the following spring :—

Plant.	Condition.		Remarks.
	Fall, 1895.	Spring, 1896.	
Crimson Clover......	2-4 inches high, smothered by rye; light covering by the time of the first frost.	Entirely killed out; no plants to be seen May 12th.	Smothered by rye.
Mammoth Red Clover	2-3 inches high, weakly; ground fairly covered by rye	Light cover; best where unprotected by rye.	Fairly good cover.
Alsike Clover	2 inches; very light covering; poor catch.	Wintered well; fair cover where alone.	Fairly even growth; light cover.
Alfalfa....	5-8 inches; good catch, showing well through rye; tops killed by first "black" frost.	Wintered well on low ground; killed out on knolls.	Good growth where not crowded by rye.
Common Red Clover.	Very weak; nearly crowded out by rye.	Badly killed; very light cover; patchy.	Much too weak to be effective.
White Clover and Orchard Grass.	No improvement over last.	Killed out.	Too weak.
Alsike Clover and Orchard Grass.	Better than last; cover light, but fairly even.	Light crop on low ground.	Too weak.
Crimson Clover and Orchard Grass.	Crimson clover weak; orchard grass makes a good showing.	No clover; orchard grass makes some show.	Too weak.
Field Pease..........	Nearly crowded out by rye.	Only rye left.	Smothered by rye.

Summing up the conclusions it would appear that (1) rye sown as a nurse plant at the rate of one and a quarter bushels per acre proved too thick and too strong a grower for most of the clovers and prevented their full development; at the same time it furnished a certain amount of protection. (2) The seeding down took place about one month too late to secure the best results in this locality. (3) The best cover obtained was given by (*a*) Alfalfa, (*b*) Mammoth Red Clover, and (*c*) Alsike Clover and Orchard Grass.

Cover Crops tried, 1896—Upon the same piece of orchard soil as that used in 1895, one acre each of the following cover crops were sown on July 13th, 1896. These were seeded separately and alone, lightly harrowed and well rolled :—

Crimson Clover	20 lbs. per acre.
Mammoth Clover..............................	15 "
Alfalfa Clover	15 "
Common Red	12 "
Soja Beans	60 "
Cow Pease	2 bushels per acre.

Field Notes—Crimson Clover—Appeared in 5 days, even, fairly strong. Aug. 12th, 3 inches high, covering ground fairly well; strongest in partial shade. Oct. 14th, strongest plants 15 to 18 inches. On the lighter and poorer parts of the orchard the plants are rather weak.

Mammoth Clover—Appeared rather sparsely in 6 days. Aug. 12th, growth moderate, weeds principally "purslane" *(Portulaca oleracea)*, taking possession. Oct. 14th, strong, even growth throughout; average, 12 inches high, giving a close heavy covering.

Alfalfa—Came up in 5 days, remarkably even and strong catch. Aug. 12th, 8 to 10 inches high, completely covering the ground. Oct. 14th, knee high, very uniform. Growth, strong, even on light sand.

Common Red—Appeared unevenly in 6 or 7 days. Aug. 12th, 2 to 3 inches high; ground partially covered. Oct. 14th, 6 to 10 inches high; rather thin here and there. Not heavy enough.

Soja Beans—Appeared promptly and evenly in 5 days. Aug. 12th, plants 8 to 12 inches high, vigorous. Oct. 14th, quite black and leafless; killed by first frost; ground practically unprotected at this date.

Cow Pease—Germinated evenly in 5 or 6 days. About right as to quantity; making strong growth. Aug. 12th, plants 10 to 12 inches high, nearly shading ground. Oct. 14th, exactly the same condition as Soja Beans.

There is little to be said in favour of *soja beans* or *cow pease* as cover crops for northern localities. They grow rapidly, produce a considerable amount of foliage and vine, but are cut down by the first light frosts. Apart from their office as collectors of nitrogen, they do not seem to furnish as much surface protection, as buckwheat or rye, and certainly not as much as field pease.

NOTES ON THE BEST COVER CROP PLANTS.

Alfalfa Clover—Is a plant of slender, upright growth and does not branch much the first year if uncut. It does not, therefore, furnish as much leafy covering to the surface of the soil as is afforded by the same number of plants of Mammoth Clover, which stool out better and are naturally more spreading in habit of growth than the upright Alfalfa Clover. This plant does very well on sandy soils and seems able to penetrate the hardest subsoils and maintain itself where Crimson Clover would starve.

Crimson Clover—Will, I fear, in this locality serve only one of the ends for which it is sown, viz., that of keeping down weeds and adding to the fertility of the soil, without protecting it very much during the winter. It is possible that selected strains of northern bred seed may be produced that will give plants capable of withstanding the severity of our northern winters. A desirable field for patient and painstaking work presents itself in this connection. On light and poor sandy soils this variety makes a very weak growth.

Common Red—This possesses no advantage over the Mammoth Red and is a weaker grower.

Mammoth—I am of the opinion that this will prove the most satisfactory cover crop for all the northern apple and pear growing sections. It germinates promptly, (good seed) soon takes, and holds possession of the ground to the exclusion of weeds; is fairly deep rooted; covers the ground with a good mat in the autumn, and begins to grow at a moderately low temperature in the spring. A block of six acres of this clover sown July 10th, in one of the apple orchards had produced an ideal protective covering when covered by snow this autumn. (See Chemist's report for a discussion of the fertilizing value of the clover mentioned above).

FRUIT BUDS OF PEACHES AND PLUMS—THEIR RELATIVE HARDINESS.

The cause of the frequent and sometimes chronic unfruitfulness of apple and pear orchards is invariably a source of deep financial interest to the fruit grower, besides furnishing subjects for the speculation of the theorist and for the investigation of the scientist. It is cheering to note that the efforts of patient scientists and observant fruit growers are being rewarded each year, by the addition of some new facts to our store of knowledge upon this subject. The work of Prof. Waite upon pear blossoms has been duplicated by Prof. Beach on grapes, and gives us a large amount of valuable data. My object at this time is to present some thoughts and some facts, bearing upon the relative ability of the fruit buds of our cultivated peaches and plums to withstand low and rapidly fluctuating temperatures.

The fruit bud is, like the leaf bud after all, only a modified branch a good deal compressed.

Parts of the blossom—Beginning at the centre of a cherry, peach or plum blossom, we find the pistil or female organ. It is composed of a dilated basal portion, the ovary—a long tube-like prolongation—the style, with a knob-like termination, called the stigma. The pistil is made by the fusion of two sessile leaves—that is, leaves without stems. Around the pistil we find a small army of stamens—these, too, are modified leaves, modified for a certain purpose. A single stamen is made up of a delicate stalk (filament) ending in a

cylindrical blade (anther). The anther contains the pollen sacs which lie on both sides of the connective line. There are usually 4 pollen sacs in each anther. The pollen is developed by a modification of the internal cell tissue which forms pollen grains. These pollen grains, are then liberated by the splitting of the anther, which at the same time opens the pollen sacs. The power which art may exercise over plant growth is shown in the modification of a stamen into a petal, as in the doubling of flowers, and even into green leaves, which is a still more retrogressive action. Surrounding the stamens we find a series of delicately constructed and beautifully coloured envelopes. These assist in protecting the organs within, but their principal function is to attract. Outside the petals are the sepals, another set of leaves whose mission is to protect. This, in brief, is a type of a flower, and describes the arrangement of the cherry blossom. There are thousands of variations, but all amenable to the general conception that a flower is a modified shoot with its parts arranged in whorls or sets and corresponding to the arrangement of the twig, and as such may be transformed from one series to the other.

Pollination and fertilization—Prof. Bailey, in his excellent book on plant breeding, emphasizes the destinctive difference between pollination and fertilization—terms which are often used somewhat loosely. Pollination, as defined here, is the artificial or manual part of the work of carrying, or transferring, the pollen from one flower to another. Fertilization is the work of the pollen itself, and refers to the growth of the pollen tube down through the connective tissue of the style, to the cavity of the ovary, where fecundation takes place. The stimulus which the process of fertilization imparts to the ovule, and which results in the development of seed, is also transmitted to the tissues of the ovarian wall, We recognize this in the rapid modification of the flowers of apples and pears after fertilization takes place. With the development of the seed, the carpels surrounding these, become modified from green tissue to ripened fruit. Such is the natural course of events when nothing untoward has happened to injure the bud during the period of its dormant condition.

Effect of Frost upon Vegetable Tissue—The reasonableness of the statement that it is the temperature of the surrounding air that chiefly determines the temperature of twigs and branches, as well as the more delicate parts, such as fruit buds and leaf buds, and their sympathetic action, will be at once admitted ; yet many people speak vaguely about the benefits of mulching trees heavily after the ground is frozen, in order to hold the frost in the ground in the spring, and by this means retarding the opening of the blossoms. One experiment of this kind if fairly tried will convince the most skeptical that the buds with their store of prepared food, respond towards spring, after their accustomed winter's rest, to the temperature of the air which surrounds them, regardless of the temperature or condition of the soil. A study of the effects of frost upon plant tissue is exceedingly interesting. In looking into the literature on this subject, I have found in "Diseases of Trees," by Prof. Hartig, of Munich, many valuable facts and observations which I am pleased to present.

First, then, the effect of frost upon *green* tissue. When the tissues of the leaves or cortex, and, in fact, when any parenchymatous green tissues are frosted, pure water is withdrawn into the adjoining intercellular spaces, but the cells themselves do not generally freeze. The result is that the cells lose their turgidity and at the same time the leaves begin to droop.

When a thaw occurs in the frosted parts of a plant the tissues usually regain the condition which characterized them before the frost appeared. As the water is set free by the melting of the ice it is slowly absorbed by the cell walls and the cell contents. In many cases, however, it is found that the parts have been killed. Instead of the chemical processes that are revived under the action of a recurrence of normal metabolism—living conditions—they imitate chemical decomposition. Views are divided as to the time when frost proves fatal. Some say during continuance of frost. Sachs, the eminent botanist, is of the opinion that the tissues die only after they have thawed and that the issue depends much upon the manner of thawing. Both theories are probably correct at different periods in the life of the plant.

When *green and growing tissue* is frozen the issue depends not only upon the severity of the frost but upon the manner of thawing. Should the plant thaw gradually,

the water which has been extracted is reabsorbed by the walls and contents of the cells at the same rate as it is formed from the ice crystals, by the gradual accession of heat, so that normal conditions are restored. In the case of a rapid and marked rise of temperature, the ice thaws rapidly and the ice-water flows into and remains in the intercellular spaces, driving out the air and causing, in the case of green leaves, the translucent appearance so well known. Chemical processes start afresh under the influence of the rise in temperature. Instead of these processes going forward in the ordinary manner, decomposition sets in, resulting in dried and withered foliage.

Considering now the action of frost upon what we call *dormant wood*, this writer says:—"Death of a plant under the action of frost during winter bears a close resemblance to the effects of drought on vegetable tissues." Severe frost, as before stated, abstracts moisture, and in proportion to its severity. The cells may, therefore, die in winter when this deficiency of water exceeds a certain limit. Hartig says again that "a change is induced in the molecular constitution of the protoplasm rendering it incapable of retaining any considerable quantity of water. This change is brought about probably by the formation of new molecular groups" Speaking of the effects of drought and frost he says: "Should the critical limit of drought not be passed, the cell gradually reabsorbs and life functions may proceed. If this critical point is passed, the cell cannot reabsorb and it withers. The same holds true with regard to the action of frost, as inducing a loss of water." The cell will bear a certain amount of frost, such as will not disturb the molecular arrangement of the protoplasmic particles, but as in the case of drought when this limit is overstopped the cell is unable to recover the water abstracted by the process of freezing, and death ensues. This may be illustrated by the action of frost upon starch paste. Frost separates the water from the starch; but subsequent thrawing still leaves the water and the starch in a separated condition. Our winters are rarely so cold that our forest trees become injured by molecular disorganization of the protoplasm of their cells. These have become inured by long and gradual processes of acclimatization. Not so with exotics, including many varieties of ornamentals and not a few classes of fruit trees, among which we may mention peaches and plums.

The absorption of water by the roots ceases, when the ground is frozen to a depth that is reached by the roots of the young plants. No harm is done growers if the trees are protected above ground against evaporation, by snow or other covering. The twigs and exposed branches in cases of extreme frost then suffer as if affected by severe drought. Warm south winds causing evaporation during winter, then, assist this injurious effect. "The limits of forest growth, in my opinion, are as much determined by action of this kind of drought as by low temperature." (Hartig).

The manner of destruction of the fruit buds of peaches and plums is undoubtedly analogous with the conditions, causes and effects outlined above. In many cases they (the fruit buds) being the tenderer parts in the plants' anatomy, are injured, while the leaf buds pass through uninjured. In their composition there is perhaps a larger percentage of water and more or less soluble assimilated food material than in the leaf buds. For this reason they are oftener influenced by sudden climatic changes than the leaf bud, approaching as they do more nearly the physical character of the green leaf, they are thus more liable to injury from sudden cold followed by a rapid rise of temperature. It is the temperature of the surrounding air that chiefly determines the temperature of the twigs, and I may say the vegetative action of the buds. The roots may be encased in a mass of frozen soil and covered with a sheet of ice, yet if the conditions of the atmosphere are favourable, leaves and flower buds will expand and develop, at least till the food material stored up for immediate assimilation becomes exhausted. In this respect the similarity between the action of the fruit bud and that of the seed, with its store of prepared food may appropriately be pointed out. This leads me to say again, therefore, that in my opinion no amount of what might be called artificial precaution that might be taken in the way of providing heavy ground mulches would affect the time of blossoming of fruit trees to any appreciable extent, and certainly not to the extent of holding them back so that injury from late frosts might be averted.

An effort, which I may say was only partially successful, was made last year to ascertain the relative amount of winter injury sustained by peaches and plums throughout

Ontario. After beginning the investigation many collateral questions of great interest arose in connection therewith. These perhaps in a measure clouded the main object, which was to discover by examining the buds of the same variety from different localities, whether or not they were characterized by a more or less fixed ratio of hardiness whereever grown. Owing to the varying conditions, it was found exceedingly difficult to arrive at reliable data. Twigs of the same varieties bearing fruit buds were secured from a number of localities. Some of the buds were examined with a hand lens, but a majority of the scions were placed in water in a hot-house, where they were allowed to expand at will. While the results may not be in accord with the experience of some growers, by reason of peculiar soil or climatic conditions, yet I believe that they represent in a general way the ability of a number of the standard varieties of peaches and plums, to produce fruit after winters of unusual severity, and may in this way be of service to planters.

It is a well recognized fact that in the case of peaches the percentage of fruit buds killed, does not represent inversely the percentage of a full crop which may be looked for. If a fruit set, for every fruit bud that blossomed, much less opened, then would thinning become an annual necessity instead of it being, as at present, an occasional possibility. At the close of the fruit season, circular letters were directed to those who so kindly furnished the scions, asking for approximate crop returns of peaches and plums, in order to compare these with the estimates made by examining the buds. An element of error, at first not appreciated, affecting the accuracy of the results obtained from the examination of the fruit buds, lies in the fact that many of the buds received, were cut no doubt from the lower branches of the trees, because easier to secure. Observant fruit growers will have noticed that during years of light crops—when frost has been the lessening agency—the major portion of the crop is often upon the upper branches of the trees, where the temperature was probably at the critical period, somewhat higher, that is warmer, than the stratum of air surrounding the lower branches.

A list of peaches, made out in order of hardiness of fruit bud, based upon the results of these investigations, which I wish to record as preliminary, tentative and subject to revision, rather than permanent and final, would read as follows :—

Group 1—

Hill's Chili,
Longhurst,
Barnard,
Early Rivers.

Group 2—

Salway,
Smock,
Tyhurst's Seedling,
Wager,
Yellow St. John,
Amsden June.

Group 3—

Hyne's Surprise,
Hale's Early,
Fitzgerald,
Foster,
Reeve's Favourite,
Crawford Late.

Group 4—

Crawford Early,
Wheatland,
Mountain Rose,
Early Richmond,
Red Cheek Melocoton,
Old Mixon,
Alexander,
Early York,
Garfield,
Champion,
Shaw's Rareripe,
Stephen's Rareripe.

Following the same system with regard to plums, I would group them as follows :—

Group 1—

English Damson,
Shropshire Damson,
Blue Damson,
Canada Orleans.

Group 2—

Lombard,
Smith's Orleans,
Moore's Arctic,
Reine Claude,
Glass Seedling.

Group 3—

Duane's Purple,
French Prune,
Coe's Golden Drop,
Field,
Grand Duke,
General Hand,
Pond's Seedling.

Group 4—

Quackenboss,
Washington,
Victoria,
Yellow Egg,
Jefferson,
German Prune,
Bradshaw,
Columbia,
Gueii,
Prince's Yellow Egg.

Group 5—

Italian Prune (Fellemburg),
McLaughlin,
Niagara,
Prince of Wales,
Prince Engelbert,
Shippers' Pride,
Burbank,
Ogon.

Group 6—

Abundance,
Prunus Simonii,
Satsuma,
Willard.

DEDUCTIONS.

Tender fruit buds are not always correlated with tender leaf buds, *e.g.*, Glass Seedling suffers less from the winter killing of the terminal shoots at Ottawa than most other varieties of *Prunus domestica*, yet it bears fruit only when winter visits us in its mildest form. Other varieties which have their terminal wood killed back almost annually, very often produce fruit regularly upon spurs situated on the older branches. The substance then of the result of these investigations is, that there is a striking difference in the relative ability of varieties of peaches and plums to withstand the injurious effects of low temperature, coupled with rapid fluctuation. To overcome this, growers should select the hardiest varieties having commercial merit, planting them in situations furnishing climatic conditions subject to the least possible fluctuations of temperature.

Finally, cultivate in such a manner as will encourage the most thorough ripening of the wood and fruit buds possible. After this,—the fruit, and when we get the fruit, it is Grindon who says that there is just one hour, not much more, when the aroma and taste of this regal fruit—the peach—are at its highest pitch. The meridian passed, the fruit is still delicious, but now it is afternoon. This is true in part, but most of us are not so exacting and will be more inclined to agree with another of his remarks, that the composition of the peach is so exquisitely sub-liquid that while enjoying the fruit we hardly know whether we are eating or drinking. It is well to incite our desires to do better by various measures of encouragement. The following interesting letter bearing upon this subject is from Mr. Joseph Tweddle :—

"FRUITLAND, ONT., 27th June, 1896.

"DEAR SIR,—I send you herewith some records of injured buds of peach and plum secured in the orchards of Mr. J. W. Smith and Mr. E. D. Smith, Winona, Ont. The figures differ somewhat, especially with regard to Crosby peach. * * *

PEACHES. AT J. W. SMITH'S. PLUMS.

Variety.	Percentage of Buds Sound.	Actual Crop.	Variety.	Percentage of Buds Sound.	Actual Crop.
Crosby	10	$\frac{1}{4}$	Washington	80	Full.
Elberta	0	0	Reine Claude	90	do
Garfield	5	$\frac{1}{10}$	Hudson River	75	do
Reeve's Favourite	3	$\frac{1}{15}$	Empire	75	do
Early Rivers	35	Full.	Abundance	1	$\frac{1}{50}$
Early Louise	40	do	Prunus Simonii	0	0
Mountain Rose	5	$\frac{1}{10}$	Ogon	50	Full.
Early Crawford	15	$\frac{1}{2}$	Lombard	90	do
Early Richmond	30	Full.	Black Diamond	15	$\frac{1}{3}$
Smock, Large	10	$\frac{1}{3}$	Niagara	80	Full.
Wager	50	Full.			
Atlantic	15	$\frac{1}{3}$			

PEACHES. AT E. D. SMITH'S. PEACHES.

Variety.	Percentage of Buds Sound.	Actual Crop.	Variety.	Percentage of Buds Sound.	Actual Crop.
Crosby	80	Full.	Wonderful	0	0
Wager	50	do	Alexander	50	Full.
Willet	0	0	Early Richmond	30	$\frac{1}{2}$
Early York	0	0	Hill's Chili	50	Full.
Conkling	15	$\frac{1}{2}$	Champion	15	0
Mountain Rose	50	Full.	Early Crawford	0	0
Globe	10	$\frac{1}{4}$	Elberta	5	$\frac{1}{10}$
Waterloo	50	Full.	Foster	0	0

MULCHING TO RETARD THE BLOSSOMING OF LARGE AND SMALL FRUITS.

The question is often asked, can I by mulching the ground heavily while it is frozen, hold the frost in the ground late in the spring, and thus retard the normal blossoming period of fruit trees? The commonly proffered answer is the one in the affirmative. A simple trial will readily convince any one that this belief is erroneous.

Mulched. Not mulched.

Seedling Plum Twigs, May 5, 1896.

To test this the ground beneath apple, plum and cherry trees, in addition to the leading small fruits, was mulched with strawy manure to the depth of a foot and covering an area exceeding by ten feet in diameter the spread of their branches. The mulch was laid on about March 15th, when there was 8 to 12 inches of snow overlying the deeply frozen ground. Check trees—that is, trees not mulched—of the same variety were selected in each instance so that a proper comparison might be made.

The following notes show that there was practically no difference, in the time of blossoming of the trees that were mulched and those that were not mulched :—

Trees.	How treated.	Condition.	
		May 4th.	May 12th.
Apple.			
Duchess	Mulched	Leaf buds one-quarter open. Flower buds showing.	Roots frozen. In flower.
do	Not mulched	do do	do
Wealthy	Mulched	Leaf buds quarter grown. Flower buds showing.	Ice below manure. In flower.
do	Not mulched	do do	In flower.
Tetofsky	Mulched	Leaf buds starting. Flower buds showing.	Ice beneath mulch. Flowers half open.
do	Not mulched	Leaf buds ahead of last. Flower buds quarter grown.	Flowers about half open.
Cherry.			
Amarelle Hâtive	Mulched	Ice beneath. Leaf buds starting. Flower buds one-tenth open.	Flowers fully open.
Ostheim	Not mulched.	do do	do
Montmorency Large	Mulched.	One foot solid ice beneath. Leaf buds quarter grown. Flower buds one-fifth open.	Flowers falling.
Carnation	Not mulched	Same condition	Flowers falling.
Plum.			
Arab	Mulched	Leaf buds starting. Flower buds showing.	Flowers fully open.
Early Red	Not mulched	do do	do
Wolf	Mulched	Leaf buds swelling. Flowers ready to open.	Flowers falling.
P. Americana Seedling	do	Flower buds swelling	do
do do	Not mulched	Same condition	do
Voronesh Yellow	Mulched	Flower buds swelling	Flowers fully open.
do	Not mulched	do do	Flowers beginning to fall.
Small Fruit Plants.		May 5th.	
Gooseberry.			
Houghton	Mulched	Leaves two-thirds grown	Ice beneath mulch.
do	Not mulched	do	No difference.
Downing	Mulched	do two-thirds grown	Ice beneath mulch.
do	Not mulched	do three-fourths grown	Two or three days later.
Early Orange	Mulched	do half grown	Ice beneath mulch.
do	Not mulched	do	No difference.
Currants, Red.			
Cherry	Mulched	do two-thirds grown	Leaves full grown.
do	Not mulched	do three-fourths grown	do
London Red	Mulched	do two-thirds grown	do
do	Not mulched	do	do
Currants, Black.			
Prince of Wales	Mulched	do three-fourths grown	do
do	Not mulched	do	do
Black Champion	Mulched	do three-fourths grown	do
do	Not mulched	do two-thirds grown	do
do Seedling 1⁄5	Mulched	do three-fourths grown	do
do	Not mulched	do two-thirds grown	do nearly full grown.
Strawberries.			
Haverland	Mulched, covering 6 ins. deep.	No growth	Beginning to grow.
do	Not mulched	Growth active	Leaves fully formed.
Parker Earle	Mulched 6 inches	Beginning to grow	do half grown.
do	Not mulched	Leaves half grown	do fully grown.
Barton	Mulched 6 inches deep	No growth	Beginning to grow.
do	Not mulched	Leaves half grown	Leaves fully grown.
Martha Beverly Garibaldi Black Giant	Mulched and not mulched.	Confirmed above results.	

Deductions—It will be seen from the date given above that there was practically no difference in the time of leafing and flowering of the trees and plants mulched and those not mulched, with the exception of the strawberries. Here the conditions are unlike those surrounding the other fruits. The strawberries were completely enveloped in the covering, consequently the temperature of the vines and leaves more closely approximated that of the roots than did that surrounding the tops of the gooseberries or

Prince of Wales Black Currant.
Mulched. Not mulched
May 5, 1896.

currants, apples or cherries. In short, after its accustomed season of rest a healthy plant responds readily to the quickening influences of warmth, regardless of the frozen or otherwise condition of the roots. It is enabled to do this by reason of having a certain amount of nutriment stored in its cells which is always used for this purpose in early spring, in the same manner that the plantlet is dependent during the early days of its existence upon the food stored in its seed leaves, (see chapter on root killing). It is possible that the growth of the strawberry might be retarded so that it might have a practical bearing upon the production of fruit; but this is a question which requires further investigation.

Evaporating Apples.

In order to obtain some information regarding the relative values of some of the commoner varieties of apples, for evaporating purposes, some work along this line was carried out last fall. The principal objects in view were: 1. To ascertain the shrinkage in each case caused by paring, coring and drying; 2. To note the differences in the appearance and quality of the evaporated product from the several kinds tested.

Five pounds of the fruit of each variety were used. The apples were pared and cored with a "Family Bay State Parer, Corer and Slicer," and evaporated, without sulphuring, in the No. 1 Evaporator, kindly loaned by the G. H. Grimm Manufacturing Co., 84 Wellington street, Montreal, Que. The dimensions of this are: Width, 26 inches; depth, 24 inches; height, 48 inches. The evaporating chamber holds six wire trays, 22 x 22 inches. It is made of galvanized iron. This size is intended for family use, and is not large enough for evaporating fruit on a commercial scale. It is probably economy, in the long run to purchase a larger size to begin with, as there is little difference in the amount of time or attention required to operate one successfully. In order to secure true evaporation a high temperature is necessary. This demands the closest attention, as the fruit will crisp and burn quickly, if not attended to at the right moment. Cheese cloth was used to prevent the pared apples sticking to the wire screens. A temperature uniformly between 200 degrees to 210 degrees Fahr. was maintained as evenly as possible, each sample being removed when, according to our judgment, it had reached the proper state of dryness. It will be seen that this would admit of, even with the exercise of the greatest care and best judgment, considerable variation in the condition of dryness of each sample. The results, therefore, while useful from a commercial standpoint, do not aim at chemical accuracy. I have to acknowledge the kindness of the Messrs. Grimm Manufacturing Co. in furnishing, free of charge, the evaporator and the parer used in carrying out the experiment. With regard to the latter, it works well and makes a good job of medium sized apples, but is not quite suited to paring and coring large apples, like well grown Kings, Spys or Baxters. The "Improved Bay State" will, I think, give greater satisfaction.

DEDUCTIONS.

Weight.—As evaporated or dried apples are always sold by the pound, the most profitable variety, for this purpose, other things being equal, will be that one giving the largest amount of dried product for each bushel of apples.

Graded by this standard, some of our best known commercial apples take a high place. A new variety, Patten's Greening, stands at the head with the remarkable yield of 16 pounds of dried apples to the bushel of green fruit. This may be exceptional. The flavour of the dried product is not equal to that of many others Following this variety come Baxter, Ben Davis, Golden Russet, Northern Spy, King, Ribston Pippin, Twenty Ounce and Pewaukee. Summer varieties being soft and juicy in character of flesh are unsuited for this purpose. Commercially they are rated as giving 4 to 5½ lbs. of dried apples per bushel, while winter varieties yield 6 to 7 lbs.

Colour.—The flesh of some kinds quickly changed colour, turning brown on being cut, while that of others did not discolour neither as rapidly nor to the same extent. Sulphuring largely overcomes this defect, but an apple whose cut surface dries white instead of brown on exposure to the atmosphere is distinctly to be preferred to one that rapidly turns brown under the same treatment.

Among varieties that retained their colour well may be mentioned Baxter, Duke of Connaught, Lawver, Missouri Pippin and Walbridge.

Texture.—Most of the varieties when dried retained their original characteristics of texture. This was dependent somewhat upon the state of maturity and ripeness. Over-ripe apples lost colour more rapidly and showed a greater shrinkage than did those in good condition. The dried product of these was also inclined to be brittle. To obtain the best results apples should be evaporated before they reach a state of maturity—perfect maturity from the dessert standpoint. The evaporated product will have better texture and colour, if manufactured when the apple is still crisp, firm and somewhat green. If evaporated at this stage the flavours are more fully retained in the dried article, in the same way that sauce made from partly ripened apples contains more of the delicate

aromatic flavours than is found in the same variety, if cooked when fully ripe and in good eating condition.

Variety.	Weight Pared and Cored.		Weight Dried.		Length of Time Drying.		Percentage of Water evaporated.	Weight of Dried product in each bushel of 50 lbs.		Remarks upon appearance and character of dried product.
	Lbs.	oz.	Lbs.	oz.	Hrs.	min.		Lbs.	oz.	
Ben Davis........ ...	3	6	0	15	1	45	72·2	9	6	Brown, corky; subacid.
Baxter	4	2	1	0	2	43	75·7	10	0	Pinkish-white, tough; subacid.
Colvert........	3	9	0	11½	1	50	79·8	7	3	Yellow, brittle; acid; fair.
Cross...............	3	4	0	12	2	00	76·6	7	8	Brown, brittle; mild subacid.
Cinnamon...........	3	9	0	10½	2	30	81·5	6	9	Chocolate, brittle; poor flavour.
Canada Baldwin.....	2	13	0	12½	1	38	72·2	7	13	Yellow, tough; acid; good.
Duke of Connaught..	3	6	0	11	1	40	79·6	6	14	White, tough; insipid.
Fameuse............	2	14½	0	11	1	20	76·3	6	14	Yellow, brittle; rather insipid.
Gideon	3	9½	0	10	2	25	82·6	6	4	Brown, brittle; insipid; over-ripe.
Golden Russet.	2	14	0	15	1	25	67·4	9	6	Brown, tough; mild subacid.
Greening, R. I.......	3	6½	0	13½	1	40	75·1	8	7	Brown, tough; subacid; good.
Hartshorn..........	3	4½	0	12	1	45	77·1	7	8	Brown, brittle; sweetish.
Hurlbut........... .	3	7½	0	12½	1	53	77·4	7	13	Yellow, tough; woody; insipid.
Hibernal	3	9	0	8½	2	15	85·0	5	5	Brown, tough; sharp acid.
Haas...............	3	1	0	10	1	45	79·6	6	4	Brown, brittle; good flavour.
King..........	4	1½	0	14½	2	38	77·8	9	1	Yellow, tough; fine texture; good.
Lawver.......	3	2	0	12½	1	55	75·0	7	13	White, tough; mild acid; over-ripe.
Longfield...........	2	12	0	9½	1	32	78·4	5	15	Brown, brittle; sweet; insipid.
Late Winter.........	3	12	0	11	2	5	81·6	6	14	
Malinda.............	3	4½	0	13½	1	45	74·2	8	7	Yellow, tough; sweet; insipid.
Mo. Pippin.........	3	1½	0	13½	1	35	72·7	8	7	White, tough; subacid; good.
Melonen............	3	2½	0	9½	1	55	81·1	5	15	Yellow, tough; insipid; over-ripe.
McMahan...........	4	2	0	13	2	15	80·3	8	2	White, brittle; subacid.
Northern Spy........	4	1	0	15½	2	50	76·1	9	11	Yellow, tough; good flavour.
North Star...........	3	8½	0	8½	...	.	84·9	5	5	Brown, tough; sharp acid.
Pewaukee	3	11½	0	13½	2	30	77·3	8	7	Yellow, tough; acid.
Pewaukee (6 lbs.)....	4	5	0	14½	2	40	78·9	7	9	
Plumb's Cider........	3	10½	0	10½	2	45	82 0	6	9	Yellow, tough; acid.
Patten's Greening....	3	7	1	0	1	35	70·9	16	0	Yellow, tough; insipid.
Princess Louise.....	2	15	0	10	1	35	78·7	6	4	Yellow, tough; subacid; over-ripe.
Ribston Pippin.....	3	7½	0	14½	2	4	73·8	9	1	Yellow, rather brittle; subacid; good.
Romna..............	3	8½	0	12	2	5	78·7	7	8	White, tough; acid; pleasant.
Rawle's Janet........	2	10	0	12	1	30	71·4	7	8	White, brittle; brisk subacid.
Scarlet Pippin..... ..	3	5	0	10½	2	34	80·1	6	9	
Spitzenberg.........	3	6	0	13	1	40	75·9	8	2	Brown, tough; flavourless.
Scott's Winter.......	2	11	0	8½	....	....	80·2	5	5	Yellow, brittle; sharp acid.
Snyder..............	2	10½	0	8½	1	50	80·0	5	5	Brown, brittle; subacid.
Sops-of-Wine........	3	2	0	10	1	20	80·0	6	4	Yellowish-white; brittle; insipid.
Swayzie Pomme Grise	3	0	0	13	1	28	72·9	8	2	Yellow, tough; good flavour.
Simbirsk, No. 4......	3	4½	0	9½	2	0	81·9	5	15	Chocolate, brittle; fair flavour; over-ripe.
St. Lawrence.... ...	3	1	0	10½	1	35	78·5	6	9	Yellow, tough; good flavour; over-ripe.
Sharpe's Russet	3	1	0	12	1	40	75·5	7	8	White, tough; brisk acid.
Twenty-Ounce.......	4	3	0	15	2	20	77·6	9	6	Yellow, tough; mild subacid.
Winter Bough.......	4	2½	0	11	2	20	83·4	6	14	Brown, brittle; subacid; poor.
Watterson, No. 3....	3	2	0	13½	1	35	73·0	8	7	White, tough; acid; good.
Wallbridge...........	3	3½	0	11½	1	37	77·6	7	3	White, tough; sharp acid.
Wealthy............	2	15¾	0	7¼	2	26	84·6	4	8	Yellow, tough; brisk acid.

General Remarks.

In speaking of evaporated apples and the old fashioned dried product, it is well to point out the important difference between the two. Sun dried fruit is that which has lost a large part of its water by natural evaporation. Very little, if any, chemical change has taken place in its constituent parts. Evaporated fruit is that from which the moisture or water has been extracted by being subjected to rapidly moving currents of hot air. This air is heated to a temperature of about 220 degrees Fahr. The fact that the sliced apples do not burn or become cooked in this high temperature is based upon the principle that the evaporation of water is a cooling process, inasmuch as the vapour carries with it a large amount of heat in latent form, thus keeping the temperature of the apple far below that of the surrounding air. It is also claimed that by this treatment the albumen is coagulated instead of being dried. Chemical changes are also said to take place in the pectins which are converted into forms of sugar not easily decomposed. In other words, the moisture is extracted at the same time that the fruit is sterilized. This process, of course, requires specially constructed apparatus. There are now many kinds of evaporators. Instructions for the preparation of the apples and the management of the dryers are furnished with each evaporator sold.

Evaporating—The mode of preparing apples for drying in an evaporator is to pare them, core and slice them into rings. This is done very rapidly by ingenious machines, which may be bought at moderate prices.

It is customary now to submit the pared apple before or after slicing to the fumes of sulphur, which process is called "bleaching." This improves the appearance of the fruit by preventing discoloration and preserving the natural colour. The sulphur is placed in a vessel over the fire and the fumes pass up through the fruit resting upon the trays above. Provision should be made for the escape of the fumes above. The time occupied in doing this need not exceed 25 minutes. After bleaching, the fruit is placed on wire trays made to fit inside the drying chamber of the evaporator, and there remains till sufficiently dried. The time occupied may vary from two and a half to four hours. It should not remain until crisp, but should be removed while it is yet soft and somewhat tough.

The kinds of driers in use are: 1. Portable; varying in size with capacity of 5 to 150 bushels per day. 2. Kiln drier; a cheap form. 3. Tower drier; generally used in western New York, where the work is done on a commercial basis. 4. Steam drier; rather newer than the other systems and probably the most desirable.

Packing the Dried Fruit—The fruit should not be packed for 24 hours after drying. It is then packed in paper lined boxes holding 25, 50 or 75 pounds. A 50-pound box is 24 inches long, 12 inches deep and 12 inches wide. Evaporated apples are packed in the same manner as the raw article, that is to say, the head is "faced." To do this, nail on the cover and take off the bottom, line it with paper, upon which a layer of rings is regularly placed, with each ring overlapping the others. After "facing" one or two layers the box is filled and the bottom replaced, the box is then properly branded and it is ready for the market.

THE CANNING INDUSTRY.

Varieties of Fruits and Vegetables Preferred by Canners.

The growth of the canning industry in Canada has been marvellously rapid. Nineteen years ago it is said that there were but two small canning establishments in the Dominion. With the extension of fruit culture and a knowledge of the fine quality of Canadian fruits came the growth and development of the canning industry. The pack of vegetables and fruits has increased gradually each year. It is estimated that Canadian canners now pay annually to farmers $500,000 for fruits and vegetables, and as much more to manufacturers for cans, solder, labels and shipping cases. Mr. W. P. Innes, of Simcoe, stated before the tariff commissioners recently that the canning factories of the Dominion represented invested capital in plant and machinery equal to half a million dollars and gave employment to 6,000 workers for six months of the year. Mr. Innes says:—"There are at least 27 factories in Ontario, 6 in Quebec, and at least one each in Nova Scotia, New Brunswick and Prince Edward Island and one or more in British Columbia."

During the past year a number of letters have been received from market gardeners and small fruit growers asking for information relative to the best varieties of fruits and vegetables to grow for canning purposes. In order to obtain the views of canners upon this important matter, a circular letter was addressed to the heads of as many of these establishments as were known at the time. The managers very courteously gave the information, which is condensed into the following tabular statement. Returns have been received from 23 factories in Ontario, 2 in Quebec, 1 in Prince Edward Island and 3 in British Columbia. Statistics relating to the industry in British Columbia were obtained through the kindness of the Deputy Minister of Agriculture Mr. J. R. Anderson.

The varieties have been arranged according to their degree of popularity with canners, the one recommended oftenest coming first and the others following in order of preference. Where the same numeral is placed opposite one or more varieties it means that such kinds are in equal demand. The prices are estimated and averaged, but will naturally fluctuate from year to year, depending upon the supply, except, where the crop is grown under contract, as is usually the case with vegetables.

Classes of Fruits and Vegetables.	Varieties in order of Preference.	Average Price per 100 Pounds.			
		Ontario.	Quebec.	British Columbia.	20 lbs. = 1 basket. 1 lb. = 1 quart. 186 lbs. = 1 barrel. 50 lbs. = 1 bushel. 60 lbs. = 1 bush. of tomatoes.
		$ cts.	$ cts.	$ cts.	
Apples	1. Baldwin, 2. Greening, 3. Fameuse, 4. Keswick Codling, 3. Snow, 3. Maiden's Blush, 3. Spy, 3. Russets, 3. Cooper's Market, 3. Ben Davis. Siberian Crab.	0 45	....	1 25	
Pears	1. Bartlett, 2. Flemish Beauty, 2. Clapp's Favourite, 3 Keiffer, 3. Sugar	2 16	....	2 66	
Plums	1. Green Gage, 2. Lombard, 3. Yellow Egg, 4. Damsons, 4. Imperial Gage, 5. Victoria, 5. Blue Plums, 5. Monroe, 5. Red Egg, 5. Columbia, 5. Coe's Golden Drop, 5. General Hand.	1 95	....	1 83	
Peaches	1. Late Crawford, 2. Smock, 2. Longhurst, 3. Wager, 3. Ey. Crawford, 3. All kinds, 3. Yellow Peaches.	1 50 to 4 00	....	....	
Cherries	*1. Royal Ann, 2. Kentish, 2. Black Tartarian, 2. Napoleon, 2. Governor Wood, 2. Ey. Richmond, 2. Yellow Spanish, 2. White varieties.	3 75	....	4 12	

THE CANNING INDUSTRY—*Concluded.*

Classes of Fruits and Vegetables.	Varieties in order of Preference.	Average Price per 100 Pounds.			
		Ontario.	Quebec.	British Columbia.	20 lbs. = 1 basket. 1 lb. = 1 quart. 186 lbs. = 1 barrel. 50 lbs. = 1 bushel. 60 lbs. = 1 bush. of tomatoes.
		$ cts.	$ cts.	$ cts.	
Grapes......	Not used..........	....	....	....	
Raspberries.	1. Cuthbert, 2. Marlboro, 2. Schaffer, Philadelphia Red, 2. Black Caps.	5 30	....	6 25	
Gooseberries	1. Downing, 1. Ashton Red, 1. Oregon Champion, 1. Warrington, 1 White Smith, 1. Lancashire Lad.	4 16	....	4 00	
Currants...	1. Fay's Prolific, 2. Lee's Prolific, 2. Cherry Currant, 2. Naples, 3. Champion, 3. White Grape.	4 25	....	3 62	
Blackberries	1. Snyder, 2. Bangor, 2. Taylor, 2. Kittatinny, 2. Taylor's Long Black.	5 62	....	4 00	
Strawberries	1. Wilson, 2. William's Prolific, 2. Crescent, 3. Manchester, 3. British Queen, 3. Jessie, 3. Albany, 3. Sharpless, 3. Jacunda.	5 60	....	5 91	
Blueberries..	....	....	....	3 00	
Asparagus...	Not generally used..........	4 00	....	....	
Beans	1. Early Refugee, 2. Golden Wax, 3. White Wax, 4. Valentine, 4. Early Crystal, 4. Detroit Wax, 5. Black Wax.	1 09	....	1 10	
Cauliflowers..	Henderson's Snowball.	2 25	....	2 50	
Cabbage......	Not used..........	....	....	....	
Corn.......	1. Crosby's Early, 1. Stowell's Evergreen, 2. Hickox Sugar, 3. Old Colony, 4. Shaker's Early, 5. Henderson's Sugar, 5. Perry's Hybrid, 5. Sweet Vars, 5. Country Gentleman.	0 34	0 50	....	
Cucumbers .	1. Long Green, 1. Boston, 1. Chicago, 1. Gherkins.	1 00	....	1 00	
Onions.	1. Yellow Danvers, 1. Egyptian, 1. Silver Skins, 1. Small Onions.	0 75	....	0 90	
Pease..	1. Horsford's Market Garden, 2. McLean's Advancer, 2 Champion, 3. McLean's Little Gem, 4. Alpha, 5. Alaska, 5. Bliss, Abundance, 5. White Marrowfat, 5. Telephone, 5. Stratagem, 5. American Wonder, 5. Kentish Gem, 5. Any sweet varieties.	1 12	....	1 25	
Peppers......	Not generally used..........	3 50	....	....	
Rhubarb....	Cahoon's Mammoth, Myatt's Linnaeus. Victoria.	1 00	....	1 25	
Tomatoes...	1. Livingston Perfection, 2. Livingston Royal Red, 2. Any smooth, red variety, 3. Ignotum, 3. Livingston Favourite, 4. Paragon, 4. Red Queen, 4. Stone's Matchless.	0 39	0 33	1 00	

*A favourite in British Columbia.

PRESERVATION OF GRAPE JUICE.

The manufacture and consumption of grape juice in its natural, fresh condition is increasing each year, aided as it is by the greatly increased production of grapes. As a beverage it is wholesome and refreshing. There is probably a market in Canada for a considerable quantity of grapes in this form, and the market might be annually extended if it were more generally understood that the unfermented article could be satisfactorily

and cheaply preserved. It may be explained here that alcoholic fermentation which takes place in the manufacture of wine and beer transforms the sugar or glucose into alcohol and carbonic acid. This action is brought about by the rapid growth of certain vegetable organisms known to the bacteriologist as ferments. The ferment of yeast is recognized as a type of the family, though the particular species in this case is distinct from the commonest ferments of wine. The ripening and subsequent decay of fruits is due to the action of ferments. The juices of all fruits, if exposed to ordinary atmospheric conditions, are rapidly transformed by the action of ferments from what may have been the sweet, aromatic and palatable substance, to that which is acrid, acid or alcoholic. Fermentation can take place only under favourable conditions of temperature. If the temperature is too high the ferments are destroyed ; if too low, their growth is prevented. Their growth may also be prevented by the use of certain antiseptic substances, aided, by completely excluding air, from the material to be preserved. If the germs of ferment have been destroyed and the substance to be preserved is at once inclosed in an air-tight vessel and hermetically sealed, there is usually no difficulty in preserving it unchanged, for an indefinite period. Success depends upon thorough sterilization and subsequent complete exclusion of air. The use of antiseptics as a means of preserving vegetable beverages in an unfermented condition is not a commendable practice. Sterilization, or what is now called Pasteurization, combined with the complete exclusion of the atmosphere, is the most practical as well as the most effective method within reach of the grape grower.

Process of Manufacture.

A considerable quantity of what is commercially known as "pure grape juice" or "unfermented grape juice" is now being made in Canada and the United States. The process of manufacture is usually as follows : Sound, clean grapes are selected and their juice expressed. This is at once strained through two thicknesses of bleached cotton or, what is thought to be better, a woollen cloth. The juice is then poured into a double-jacketed, covered kettle. The temperature of the juice is then brought up to 180 degrees Fahr., where it is held for 20 minutes. The report of the North Carolina Horticultural Society describes the remainder of the process as follows : "It should then be removed from the fire and allowed to stand closely covered for 24 hours. At the end of this time return it to the kettle and re-heat to 180 degrees F. for half an hour, then strain through a thick white woollen cloth into the bottles in which it is to be marketed, or, if more convenient, it may be run from the strainer into large glass carboys, or air-tight kegs, holding not more than five gallons. These must be previously sterilized by boiling water, and should be as hot as the juice is when ready to be filled. The vessels, whether large or small, must be filled until the juice begins to run out at the opening, and then corked tightly and the cork or bung covered with wax or resin to make it air-tight. If a wooden vessel is used to store the juice in, it should be thoroughly varnished on the outside to make it air-proof. If the juice is run at once into small bottles no further manipulation is required. If it is temporarily stored in large vessels, when wanted for market or consumption it must be once more heated to 180 degrees F. and strained through a woollen cloth into the bottles. When the storage vessel is opened the entire contents must be removed at once. If allowed to remain twenty-four hours in a partly filled vessel the juice will begin to ferment. This fermentation may be stopped at any time by heating the juice to 180 degrees F., but the character of the liquid as unfermented wine is lost and cannot be recovered. It is of the utmost importance that the juice be heated to 180 degrees F., neither less nor more. If heated above 180 degrees F., the albumen of the juice will coagulate and greatly deteriorate the nutritive properties, and the taste of the juice will be quite spoiled."

"If heated to less than 180 degrees F., the germs of ferment will not be killed and the juice will soon begin to ferment. To insure the proper temperature in the kettle, a glass dairy thermometer, costing about ninety cents, should be inserted through a hole in the cover and allowed to float on the juice."

EXPERIMENTS.

In October, 1893, Mr. Joseph Tweddle, Fruitland, Ont., who was interested in the manufacture of grape juice, kindly furnished this division with 150 pounds of well ripened Concord grapes, which were used in carrying out some experiments, having for their object the securing of information bearing upon the preservation of grape juice. The juice was extracted by crushing the berries and subjecting the pulp to moderate pressure, after which it was strained. Small quantities were treated as described below. In each case the juice was heated in a porcelain vessel, the temperature being gradually raised to the resting point, where it was held the required length of time, by the use of a tube thermometer. The vessels into which the various samples were placed, without straining were immersed in boiling water, then filled and sealed while still hot; the bottles were stored in a cupboard in a warm, dry cellar.

No. 1.—Quantity, half a gallon; held at 130 degrees Fahr. for 11 minutes; bottled in a museum hermetically sealed jar. Bottled 30th October, 1893. Considerable amount of sediment was noticed on 20th December, 1893. Fermentation began apparently about a month after bottling. Opened 17th September, 1894, and found to be quite alcoholic; 10th December, 1896, now in the form of a dry wine, lacking in spiciness.

No. 2.—Quantity, one pint; heated 10 minutes at 135 degrees Fahr.; bottled in a pint bottle, cork covered with paraffine wax. Fermentation began almost immediately. Cork thrown out 15th November, 1893.

No. 3.—Quantity, one pint; pint bottle used, stopper paraffined; heated 10 minutes at 145 degrees Fahr. Fermentation was not noted until September, 1894, when it began slowly. Opened 12th December, 1896, and found to be in the form of a mild brand of dry wine.

No. 4.—Quantity, one pint; heated 10 minutes at 160 degrees Fahr.; pint bottle, used, stopper paraffined. No change was observed in this for 11 months. It was then sent to Mr. Tweddle, who reported it fresh and palatable.

No. 5.—Quantity, one pint; heated 10 minutes at 170 degrees Fahr.; pint bottle, cork paraffined. Opened 12th December, 1896. Juice sweet; no trace of fermentation. Original flavour entirely preserved. The "boiled flavour" sometimes so prominent in beverages of this kind, not apparent. The colour of the liquid was not as clear as desirable, showing the necessity of careful straining.

No. 6.—Quantity, one pint; heated 10 minutes at 185 degrees Fahr.; pint bottle, cork paraffined. Opened 12th December, 1896. No trace of fermentation, either past or present. Flavour, sweet and palatable and refreshing. Equal to last sample.

No. 7.—Quantity, one pint; heated to 190 degrees Fahr.; in bottle, with cork paraffined. Not opened thus far, apparently in good condition, 15th December, 1896.

No. 8.—Quantity, one pint; heated 20 minutes at 190 degrees Fahr.; in bottle, with paraffined stopper. Apparently in perfect condition when sent to Mr. Tweddle, September, 1894, and so reported by him when received.

No. 9.—Quantity, one quart; salicylic acid, ·175 grammes, or at the rate of 7 grammes to each 10 gallons; not heated; cork of bottle sealed with paraffine. Opened 9th September, 1894. No fermentation had taken place. Flavour, sweet, without any suggestion of acid. Colour, that of a bright claret.

No. 10.—Quantity, one quart; salicylic acid, ·2 grammes, at the rate of 8 grammes to each 10 gallons; not heated; cork of bottle sealed with parafin. Opened 17th September, 1894, found to be in good condition, with a slight suggestion of the beginning of fermentation. Sealed again. Opened 12th December, 1896. Fermenting actively.

No. 11.—Quantity, one quart; boracic acid, ·175 grammes; in sealed bottle; not heated. 15th November, 1893, in good condition. 17th September, 1894, fermentation began quite actively. 15th October, 1894, opened and found quite alcoholic. 12th December, 1896, makes a dry wine of medium quality.

No. 12.—Quantity, one quart; ·2 grammes boracic acid; in sealed bottle; not heated. Cork proved to be defective; fermentation began within a few days.

No. 13.—Quantity, one pint; sugar, 2 ounces; heated 10 minutes at 160 degrees Fahr.; in sealed bottle. Colour, that of clear, bright port wine. Opened 12th

December, 1896. Flavour, sweet, fresh, palatable. Some sediment at bottom, which might easily be separated by straining. This sample very desirable.

No. 14.—Quantity, one pint; sugar, 3 ounces; heated 10 minutes at 160 degrees Fahr.; in sealed bottle. In good condition; that is, fresh and unfermented, when sent to Mr. Tweddle, 17th September, 1894.

No. 15.—Quantity, one pint; sugar, 3 ounces; salicylic acid, ·087 grammes; heated 10 minutes at 160 degrees Fahr.; in sealed bottle. Fermentation began two or three weeks afterwards and went on more or less actively. This was found to be due probably to a defective cork.

No. 16.—Quantity, one pint. A duplicate of No. 15. Was unfermented and fresh when sent to Mr. Tweddle, 17th September, 1894.

Deductions.—It would appear from the foregoing that the natural flavour of grape juice may be preserved intact by raising the temperature of the juice gradually to 170 degrees Fahr., keeping it at this point for ten minutes and then quickly bottling it, taking care to use absolutely air-tight and thoroughly sterilized vessels. These vessels should be taken from a tank or kettle of boiling water, immediately filled, and corked or covered, with the least possible delay. The addition of sugar in the proportion of four ounces to each quart of liquid will improve the quality and palatability of the juice of the more acid varieties of grapes, such as Clinton, Bacchus and Marion.

The use of antiseptics, such as salicylic acid, should not be encouraged. It is not probable that they would prove injurious if used in the quantities mentioned above, but in view of the fact that samples in which they were not used, were preserved equally as well as those in which they were employed, it would seem that to be really effective for this purpose larger quantities are necessary. A practice of this kind is undesirable.

Other experiments in this line are now in progress and will be reported in due time.

DISEASES OF FRUITS.

Apple and Pear Blight.

This disease, so mysterious and destructive in its methods, has again caused wide-spread damage. Its ravages were most severe on apple trees in the vicinity of Hamilton and Burlington Bay. To some extent also it was present along the eastern shore of Lake Ontario, the Peterborough and Lindsay districts, and Eastern Ontario and St. Lawrence River districts. Nearly all varieties were attacked to a greater or less extent at Freeman, near Burlington, Ont. Mr. G. E. Fisher writes that "Holland Pippin was one of the worst." Mr. Thos. Beall, Lindsay, Ont., records it as attacking English Hawthorn. At Ottawa the Mountain Ashes were injured in many instances. Mr. Fisher also points out that the disease manifests its presence and methods of attack in different ways on apples as compared to pears. The former are usually attacked through the terminal shoots, from whence the disease works downwards involving main branches and, in bad cases, finally the stem of the tree. Pears, on the contrary, show the presence of the disease more frequently by the blighting of the leafy tufts on the spurs—often fruiting spurs—found on the larger branches, and sometimes on the stems of the trees. Trees attacked in this manner should, except in cases of very mild attack, be promptly rooted out and destroyed. Instances have come under my notice where a single infected tree was the means of spreading the disease throughout an entire orchard. It has been observed in the orchard at the Central Farm and elsewhere, that the blight appears to spread in a manner that would give strong colour to the belief, that the prevailing winds have much to do with carrying it from one tree to another. The experience of each year has added some evidence to the correctness of this assertion.

Remedies.—Thus far there seems to be only one remedy, viz., to cut out and destroy affected branches without delay, on the first appearance of the disease. Diseased branches should be cut off at least 15 inches below the affected part. Diseased patches of bark on large branches of pear trees, or upon the stems should be removed and the exposed surface covered with grafting wax.

Spraying with Bordeaux mixture as a preventive has been tried here very thoroughly on apple trees, but without apparent benefit. When a young, cultivated and vigorously growing orchard is attacked, I would advise seeding it down to clover for a couple of years in order to check the too exuberant growth.

As with Black Knot, so with Pear and Apple Blight, the treatment, of necessity, is often heroic, but if rigidly practised, in connection with rational cultural methods, growers may, I believe, hold it in check. A fuller discussion of the subject will be found in the annual report of this division for 1893.

Record of Blight in Russian Apple Orchard at Ottawa.

Abbreviations used in describing virulence of the attack:—M., Medium. S., Slightly. B., Badly.

Variety.	1893.	1894.	1895.
Anisovka	S.	....	S. M.
Antonovka	B. S. B.	....	M. B.
Arabka	S. B. M.	S. M.	S. B.
Anisim 18 M	B.	....	....
Aport	B.	S.	S.
Alexander, M	B.	M.	B.
Arabka Winter (Fisk)	M. B.	S.	M.
Antonovka (Ansjutin)	....	....	S.
Beauty of the World	S.	Dead.	....
Bergadoff	B. M.	S. B.	S. B.
Beautiful Arkad (Beadle)	S.	S.	S.
Bethel	S.	B.	S.
Burlovka No. 183 (Beadle)	S.	....	S.
Blushed Calville	S.	....	....
Blackwood No. 407	B. S.	M.	B.
Broad Green No. 157 M	M.	....	S.
Borovinka	S.	S.	S.
Bogandoff (Fisk)	S.	M.	M.
Broad Cheek	S. M. S.	....	M.
Champagne	B. M.	....	B.
Cinnamon Pine	M. S.	S.	M.
Cinnamon No. 322 (Beadle)	B. M.	....	S.
Champagne Pipka	M.	S.	B.
Cross No. 413	S.	....	S.
Charlamoff No. 262	M. B.	M.	B.
Crimean	S.	....	....
Christmas No. 477 (Beadle)	B.	....	....
Dvinnoe Solovieff	S.	....	M.
Decarie (Fisk, a Quebec seedling)	S.	....	....
Enormous No. 398 (Beadle)	B.	M.	B. S.
Extra, Solovieff	S.	....	....
Early Prolific No. 332 B	M.	....	B. S.
Fonaric	B. S.	....	S.
Furst Taffet	M.	B.	B.
Foundling (a Quebec seedling)	S.	....	....
Grand Sultan	S.	....	S.
Gipsy Girl	B.	S.	M.
Golden White	M. S.	S. B	S. M.
Gros Mogul	....	....	....
Grand Duke Constantine	B.	M.	B.
Grandmother No. 469-6 M	S.	S.	S.
German Calville (Fisk)	S. B.	M.	M. B.
German Skrute No. 371 B	S.	B.	S.
Green Sweet No. 169.	S.	....	S.
Golden Reinette	S.	S.	S.
Good Peasant	....	....	S.
Howard's Best Russian	B.	Dead.	....
Hurlbut	S.	S.	Dead.
Himbur	S.	S.	S.
Herren No. 315	M.	....	....
Handsome White No. 450 B	B. S.	....	....
Hibernal	S. M.	....	S.
Imperial Citron No. 293	S.	....	S.
Jolti Biel	M.	Dead.	....
Keswick Codlin	S.	Dead.	....
Kruder No. 17 M	M. B.	S.	S.

RECORD OF BLIGHT IN RUSSIAN APPLE ORCHARD—*Continued.*

Abbreviations used in describing virulence of the attack:—M., Medium. S., Slightly. B., Badly.

Variety.	1893.	1894.	1895.
Kremer's Glass No. 284	M.		B.
Krimskoe No. 65 M	S. M.		
Koursk Annis No. 984	M.	S.	S.
Keiv Reinette	B.		
Lead	M. B.	S.	S. M.
Longfield	B.	S.	S.
Lead of St. Petersburg	M.	M.	S.
Louis' Favourite	B.	M.	M.
La Victoria, Seedling	S. M.	S. M.	M.
Lapouchoe (Koslov)			S.
Muscatel	M.	M.	S.
Marble	B.	Dead.	
Melonen	B. S.		M.
Marion, Solovieff	S.		
Marmalade	M.	S.	
Meinster			M.
Ostrekoff, No. 472 (Beadle)	M.		
Osimoe, No. 7 M	M. B.	Dead.	
Ostrekoff's Glass (Fisk)	M.	S.	S.
Orel	M.	S.	
Peach	M.	S.	M.
Pointed Pipka	M. B. S.	M. S. B.	M. S. B.
Plodovitka, Koslov			S.
Possart	B.	S.	M.
Prolific Annis No. 471 (Beadle)	B.		
Paperovka (Niemetz)	S.		S. B.
Pipka, No. 265 B	M.	S.	S.
Riga Naliv	B. B.	M.	B. B.
Rosy Repka No. 200	S. B.	S.	S. B.
Resonant, No. 352 (Beadle)	M.		S.
Russian Transparent	B. M.	S.	S. B.
Rambour Reinette	S. M.		S.
Rubicon	M.	S.	B.
Red Reinette (Beadle)	B.		S.
Revel Borsdorf (Beadle)	B.	S.	M.
Red Serinka	S.	M.	S.
Red Repka No. 200	S.		
Romna. No. 599	S. M.	S. M.	M. S. B.
Red Duke	S. M.	B.	B.
Red Stettiner (Fisk)	S.		S. M.
Red Annis No. 985	M. B.	M.	S.
Revel No. 338	S.		S.
Red Queen No. 316	M. B. S.	B.	S.
Romenskoe (Gibb)	S.		
Revel Glas, No. 170 B	S. M.		B.
Rambour, Riga	S.		
Round Borsdorf, No. 356 B	B.	S.	M.
Stettiner Kantapfel	S.		
Sweet Borovinka B	M.	S.	S.
Sandy Glas, No. 24 M	B. S.		S.
Striped Calville	S.		
Schwarze Gans. ? M	B. M.		S.
Svinetz No. 426	B.	B.	B.
Stripe	M.		
Serinka No. 107 M	M.	S.	S.
Switzer	B. M.	B. M.	B.
Scented	S.		B.
Simbirsk No. 1	S.	B.	S.
Sklanka Bogdanoff	S.		S.
Simbirsk No. 9			M.
Striped Winter (Budd)			M.
Thaler	B. S.	S. B.	S. M.
Thin Twig	S. M.	S.	S.
Tiesenhausen, No. 190	M.	M.	B.
Titovka (Gibb)	M.		M.
Titovka (Koslov)			S.
Titovka (Solovieff)			S.
Transparent Naliv B	B. S.	B.	

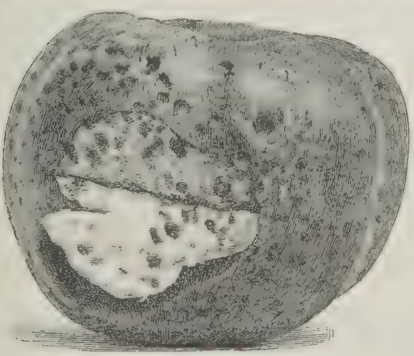
RECORD OF BLIGHT IN RUSSIAN APPLE ORCHARD—*Concluded.*

Abbreviations used in describing virulence of the attack:—M., Medium. S., Slightly. B., Badly.

Variety.	1893.	1894.	1895.
Throne No. 243 (Beadle)	S.	....	....
Table Apple	....	....	S.
Ukraine (Gibb)	M. B.	M. B.	B. S.
Voronesh Reinette (Beadle)	B.	S.	M.
Voronesh Sweet	M.	M.	....
Vargul (Fisk)	M.	S.	M. S.
White Borodovka	S.	....	S.
White Naliv, No. 157 (Beadle)	M. B.	S.	S.
Winter Calville	S.	S.	S. M.
White Pigeon	B.	....	....
White Borovinka	S.	....	....
White Borsdorf (Fisk)	S.	S. M.	S.
Worgunok No. 565 (Beadle)	B.	....	....
Wolf River	S.	....	S.
White Rambour	B.	S. B.	M.
Zakoritnoe (Duchess)	....	M.	S.
Yellow Annis No. 987	B.	M.	M.
Yellow Arcad	S. M.	M.	S. B.

A DRY ROT OF APPLES.

During 1895 and again the present season, a number of specimen apples were received from various parts of Canada, all exhibiting in a more or less marked degree the presence of a curious kind of dry rot. This was manifested exteriorly by small circular depressions on the surface or skin of the apple. These depressions were $\frac{1}{8}$ to $\frac{1}{4}$ of an inch deep and $\frac{1}{4}$ to $\frac{3}{8}$ of an inch in diameter. On removing the skin of the apple it was found that each depression was the centre of a small area of dryish brown tissue. In some varieties badly attacked, this brown and pithy tissue extended in a more or less complete network over the whole surface of the apple. Its texture was dry and tough enough to prevent it from being cut into easily with anything but a keen edged blade. The flesh of the apple was rarely affected to a depth of more than $\frac{3}{8}$ or $\frac{1}{2}$ an inch. The affected flesh was dry and flavourless, but not bitter. While the apple was not rendered wholly unfit for use, its appearance and salability were totally destroyed. At first I was inclined to think it was a form of bitter rot *(Glœosporium)*. Specimens were sent to a number of specialists in Canada and in the United States. Prof. L. R. Jones, Experiment Station, Burlington, Vt., appears to have described this trouble briefly, in 1891, as affecting Baldwins. The fungus described by Prof. Jones was identified by Mr. J. B. Ellis, of Newfield, N.J., "as being probably *Dothidea pomigena*, Schu." Prof. Jones describes a small pustule in the centre of each spot as being a characteristic indication of the presence of the trouble, and also states that the diseased tissue is pronouncedly bitter. I have found that the flavour varies somewhat, but an insipid quality without bitterness prevailed in the majority of the specimens examined. Spraying with bordeaux mixture does not seem to prevent it, as the first specimens received were from the orchard of Mr. James J. Paterson, Agincourt, Ont., which had been sprayed six times during the season under direction of Mr. Wm. Orr, Superintendent of Spraying Stations, for Ontario. Mr. Paterson writes that his trees



Apple affected with dry rot.

are young and in a healthy condition. Mr. Orr states "that the fruit on all the trees is similarly affected."

Mr. D. James, Thornhill, Ont., writes as follows on 9th January :—

"Dear Sir,—In reply to your request as to varieties of apple affected by dry fungus or dry rot, the Snows are by far the worst, yet we never had better Snow apples than this year in this section ; in the same orchard some trees are badly affected, while on others there is not a sign or trace of dry rot. The Northern Spy comes second, yet not bad ; the Seek-no-further coming third."

Mr. James is of the opinion that the trouble is largely due to some unfavourable peculiarity of the soil.

This disease has been noticed on the following varieties since 20th October, 1896 :—

Rawle's Janet, Ottawa, Ont.	Ben Davis, Ottawa, Ont.
Golden Reinette do	Lawver, Ottawa, Ont.
Salome do	Plumb's Cider do
Princess Louise do	Orange Winter do
Red Canada, Sarnia, Ont.	Romna do
Winter Rose, Kemptville, Ont.	Fameuse, Agincourt, Ont.
Hurlbut, Trenton, Ont.	Seedling do
Baldwin, Grimsby, Ont.	Golden Russet, Ottawa, Ont.
Malinda, Ottawa, Ont.	Winter Bough do
Northern Spy, Agincourt, Ont.	Patten's Greening do
Simbirsk No. 4, Ottawa, Ont.	Seek-no-further, Agincourt, Ont.
Talman Sweet, Ottawa, Ont.	Silken Leaf, Ottawa, Ont.

Apple packers should reject all specimens affected with this fungus. The small depressions, at first unconspicuous, under the confined and sometimes heated conditions afforded by the barrel, increase in size and number and discolour rapidly ; a few specimens in each barrel will thus condemn the whole consignment.

Mr. J. Dearness, London, Ont., writes me as follows on 26th January :—

"None of the specimens I examined were affected with a *Dothidea*, as that genus is defined now. It is an ascigerous fungus, each containing eight septate hyaline sporidia. Schweinitz does not seem to have so understood the genus. No. 1896 in his herbarium is named *Dothidea fructigena ;* it is on rotten apples, and No. 1909 is the *Dothidea pomigena* also on mature apples. These have been examined by Mr. Ellis and found not ascigerous. Mr. Ellis thinks the latter is a fructigenous form of *Fusicladium dendriticum.*

"I believe the disease on the apples you sent me is the same as has been called *Glœosporium fructigenum*, popularly 'bitter-rot,' but I doubt that fungus has been well described." Dr. W. T. Connell, Pathologist of Queen's University, Kingston, Ont., is at present engaged in working up the life history of this disease.

Core Rot of Apples and Pears.

Core Rot.—Gideon.

Varieties of apples, like some kinds of pears, that decay at the core while preserving an apparently sound condition on the outside, should be avoided by planters who intend doing a home market or exporting business. Such varieties deceive the grower, and the purchaser finds himself the victim of misplaced confidence. Bessemianka and Sapieganka, two Russian pears, are of considerable value on account of hardiness in regions where the temperature falls below 25 degrees below zero, thus preventing the cultivation of better varieties. The trees are perfectly hardy and the fruit, if properly handled, is very fair in quality. It must not be allowed to hang on the tree till fully ripe as it rots at the core first; but if picked when yet green and uncoloured it may be ripened successfully in the fruit house. It should be examined occasionally so that it may be used before core

rot commences. The Gideon apple possesses many good points, but has the peculiar habit of rotting at the core in the manner shown in the preceding illustration. This takes place sometimes while the apple is still on the tree. The core of the apple (which is first "water cored") becomes brown, and on losing, by evaporation, the surplus water, shrinks, becomes smaller, and separating with the carpels from the surrounding pulp, remains suspended, as it were, by its axial attachments.

Gideon should be harvested as soon as the pips begin to turn brown, and stored in as cool a place as possible. It is useless to try to keep them into winter with ordinary cellar accommodation. While the form may be retained, the flavour will be entirely lost

SPRAYING.

The number of those engaged in fruit growing who believe in spraying as a means of preventing the destruction wrought by injurious insects and fungous diseases is increasing rapidly each year. In this connection it may not be out of place to warn farmers and orchardists that, as a natural effect of the large crop of fruit this year, we may expect a comparatively small yield next year, but with insects and fungous diseases in abundance. The conditions for the development of fruit pests were favourable to an unusual degree the past season, the full effect of this will no doubt be most emphatically noticeable next season with a greatly reduced apple crop. Fruit growers should bear this in mind, and meet the enemy early in spring, fully equipped with spraying apparatus and material. Mr. W. P. Richards, of Sherbrooke, Que., says that "during the past season I sprayed my apple trees five times, and as a result consider I have completely cleared the orchard of all pests, besides having a good crop of apples." Much evidence of this kind could be adduced, but should not be necessary at this time.

Fungicides and Insecticides.

With the kind co-operation of Mr. Murray Pettit, of Winona, Ont., some experiments with various combinations of the leading fungicides and insecticides were carried out, with a view of preventing at once the cracking of the pear and injury by the late brood of the Codling Moth. The fruit of the sprayed and unsprayed were uniformly free from fungous attacks. No results were gained in this connection. The following mixtures were used :—

Spraying Mixtures :—

No. 1—Arsenate of Lead, composed of :
- ½ ounce of arsenate of soda dissolved in
- 1 quart of water,
- ¾ of an ounce of acetate of lead dissolved in
- 1 quart of water,
- 1 quart of molasses.
- Water to fill a 5 gallon knapsack spray pump.

No. 2—Lysol, composed of :
- Lysol, 1½ fluid ounces,
- Molasses, 1 quart,
- Water, 5 gallons, or knapsack full.

No, 3—Copper Carbonate, composed of :
- ½ ounce of copper carbonate (the copper carbonate dissolved in the ammonia).
- ½ ounce of lime.
- ½ ounce of Paris green,
- ½ pint of ammonia.
- 1 quart of molasses.
- Water, 5 gallons.

Spraying Mixtures—Concluded.

No. 4—Paris Green, mixture composed of :
½ half ounce of Paris green,
½ half ounce of lime.
1 quart of molasses,
5 gallons of water,

One tree of Bartlett was sprayed twice with each mixture on July 10th and 24th. The fruit was picked and graded on September 1st. The percentages below, give the results as gained by counting the number of sound and wormy specimens, found in windfalls and hand picked fruit.

SHOWING per cent of Sound and Wormy Pears.

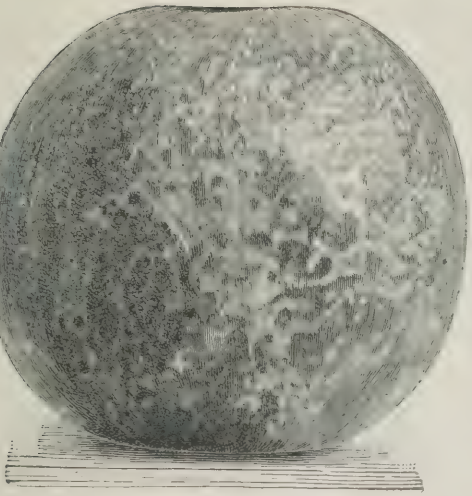
Handpicked.			Windfalls.		Per cent Wormy.
Mixture.	Per cent Sound.	Per cent Wormy.	Per cent Sound.	Per cent Wormy.	Handpicked and Windfalls.
Arsenate of Lead	50·9	32·4	....	16·7	49·1
Check	50·5	34·4	3·8	11·2	45·6
Lysol	58·9	31·5	0	9·6	41·1
Check	32·2	34·1	2·4	31·3	65·4
Copper Carbonate and Paris Green	57·7	24·2	2·2	15·9	40·1
Paris Green	46·4	36·2	1·4	16·0	52·2
Check	38·6	45·6	1·8	14·0	59·6

It will be seen that the trees sprayed with Lysol gave the largest percentage of sound fruit. Copper carbonate with Paris green also gave a large percentage of sound fruit, but a check tree immediately adjacent was wanting in this case. Compared with other checks or unsprayed trees, it makes a good showing.

These experiments may be accepted as indicative and will be repeated. The results with arsenate of lead are surprising. Last year in spraying at Ottawa to prevent injury from the *early* attacks of codling moth this insecticide gave excellent results.

FRUIT INJURED BY SPRAYING.

Since 1890. when Prof. Clarence M. Weed, then of Ohio, reported that spraying with Bordeaux mixture injured the skin of apples, certain russetting effects noticed each year have been credited to this agency. Prof. Beach (see Report of N. Y. Exp. Station, p. 673) reports extended injury, and gives a list of apples affected. The injury usually takes the form of patches, or splashes of russet upon the skin of the apple, usually confined to one side, and often to the region surrounding the basin. It varies considerably in extent, some varieties being much affected, while others show little or no injury. The injury in unusual instances is so severe, as to prevent the normal development of the apple, resulting, in these cases, in warty growths causing deformed specimens. Most varieties show a slight roughening of the skin as a result of three applications of Bordeaux mixture. This roughness is caused by a corky modification



Fameuse russetted by spraying.

of the epidermal cells of the skin of the apple. Where much affected, the modification extends somewhat deeper. I have never seen the injury so severe when Bordeaux mixture was used at the rate of four pounds each of copper sulphate and lime to a barrel of water, as to materially injure the sale of the fruit. Such cases have been reported, however. By examining the growing apple after an application of the spraying substance has been made, the operator will be able to decide by its appearance whether it is wise to continue the work of spraying, or whether, on the other hand, it is advisable to discontinue it for the season. If the first spraying—that is, the application before the blossoms open—is made very thoroughly, the amount of copper sulphate used in the applications which follow may be lessened and the possibility of injury avoided.

GARDEN PEASE.

In the subjoined table information obtained in testing 101 varieties of garden pease is submitted. They were grown under as nearly uniform conditions as possible. It is quite probable that a variety may be duplicated in the list, appearing under another name. So closely do many of the early varieties resemble each other that it is difficult to establish their identity, in trying them for a single season only. Then again there is sometimes greater variation in evidence, between individual plants of the same variety, than is observable between so-called distinct varieties. Among the early, medium and late varieties the following appear to be worthy of special mention :—

Early.	Medium.	Late.
Alaska,	Abundance,	Champion of England,
Blue Beauty,	Blue Imperial,	Juno,
Carter's First Crop,	McLean's Little Gem,	Laxton's Charmer,
Extra Early Star,	Premium Gem,	New Maud S.,
Early Kent,	Rural New Yorker,	Telegraph,
First and Best,	Wm. Hurst.	Yorkshire Hero.
King of Dwarfs,		
Nott's Excelsior,		
Ex. E'y. Market (Thorb.)		

Garden Pease.

Abbreviations—Dwarf, D; Medium, M; Tall, T: Early, E; Late, L; Wrinkled, W; Smooth, S; Round, R.

Name.	Seedsman.	Date of Sowing.	Number of Seed Sown.	Length of Row.	Date of Blossoming.	When ready for Table.	Average number of Pease in Pod.	Weight of Peas in Lbs.		Kind of Pea—Wrinkled or Smooth.	Height.	Early, Medium or Late.
		1896.		Ft.	1896.	1896.		Lbs.	Oz.			
Alaska	Thorb.	May 15.	400	30	June 17.	July 3.	6	1	4	S	D	E
American Wonder	do	do 15.	400	30	do 20.	do 7.	5	1	12	W	D	E
Alpha	do	do 15.	400	30	do 18.	do 3.	5	1	11	W	M	E
Admiral, The	do	do 15.	400	30	do 29.	do 17.	5	2	5	W	M	M
Abundance	do	do 15.	400	30	do 30.	do 18.	5	3	12	W	D	M
Anticipation	Simm	do 15.	400	30	do 30.	do 22.	6	1	5	W	M	L
Blue Beauty	Thorb	do 15.	400	30	do 20.	do 7.	5	2	11	S	M	E
Barnard's Maritime Pea		do 15.	400	30	July 6.	do 31.	6	2	8	W	T	L
Black-eyed Marrowfat	do	do 15.	400	30	July 7.	do 24.	6	3	0	S	T	L
Blue Imperial	Ewing	do 15.	400	30	June 30.	do 18.	5	3	7	W	T	M
Bergen Fleetwing	Greg.	do 15.	400	30	do 17.	do 3.	6	2	6	S	M	E
Boston Wrinkled	Breck	do 15.	400	30	do 30.	do 23.	5	2	8	W	M	L
Blue Peter	Thorb.	do 15.	400	30	do 20.	do 7.	5	2	10	W	D	E
Chelsea	do	do 15.	400	30	do 20.	do 9.	5	2	11	S	D	E
Champion of England	do	do 15.	400	30	do 30.	do 24.	6	3	4	W	T	L
Cleveland's First and Best	Ewing	do 15.	400	30	do 17.	do 3.	5	2	11	R	M	E
Carter's First Crop	do	do 15.	400	30	do 17.	do 3.	5	3	0	S	M	E
Crown Prince, No. 80	J. & St.	do 15.	400	30	do 30.	do 28.	6	3	0	W	D	L
Crooked, or Scimitar	Steele	do 15.	400	30	do 30.	do 28.	5	1	13	S	T	L
Daniel O'Rourke Improved	Thorb.	do 15.	400	30	do 20.	do 7.	5	2	11	S	M	E
Duke of York	do	do 15.	400	30	do 29.	do 13.	6	1	11	W	M	M
Dwarf White Sugar Edible Pod.	do	do 15.	400	30	July 3.	do 28.	5	2	11	S	D	L
Dwarf Wrinkled Sugar	do	do 15.	400	30	June 20.	do 7.	5	2	6	W	D	E
Duke of Albany	Ewing	do 15.	400	30	July 2.	do 26.	7	2	0	W	T	L
Dwarf Champion of England	Greg.	do 15.	400	30	June 30.	do 28.	5	3	2	W	M	L
Daisy	do	do 15.	400	30	do 24.	do 11.	6	2	1	W	D	E
Exonian	Thorb	do 15.	400	30	do 17.	do 3.	4	2	3	W	M	E
Everbearing	do	do 15.	400	30	do 29.	do 28.	6	3	7	W	M	L
Extra Early Star	Ewing	do 15.	400	30	do 17.	do 2.	5	3	0	R	M	E
Early Kent	do	do 15.	400	30	do 19.	do 4.	5	2	0	W	D	E
Eureka, Extra Early	Dreer	do 15.	400	30	do 19.	do 4.	6	2	14	S	D	E
Extra Early Pioneer	do	do 15.	400	30	do 19.	do 4.	5	2	15	S	M	E
Extra Early Dwarf Brittany	Steele	do 15.	400	30	July 2.	do 27.	5	2	4	S	D	L
Early Dexter	Farquhar.	do 15.	400	30	June 17.	po 2.	5	2	8	R	M	E
Extra Early	Land.	do 15.	400	30	do 17.	do 2.	5	3	5	S	M	E
Early Frame Improved	do	do 15.	400	30	do 17.	do 4.	5	3	1	S	D	E
Early May do	do	do 15.	400	30	do 17.	do 4.	5	2	12	S	D	E
Evergreen Pod	do	do 15.	400	30	do 20.	do 4.	6	2	3	W	D	E
Eugenie	do	do 15.	400	30	do 20.	do 20.	5	3	0	W	M	M
Extra Early Challenge	Currie	do 15.	400	30	do 17.	do 2.	6	3	8	R	M	E
Early Prize	Greg	do 15.	400	30	do 20.	do 6.	5	3	9	S	D	E
First and Best	Thorb	do 15.	400	30	do 17.	do 2.	5	3	10	S	M	E
Filbasket	do	do 15.	400	30	do 30.	do 27.	6	2	3	S	M	L
French Canner	do	do 15.	400	30	do 30.	do 24.	7	2	15	S	T	L
Forty Fold	Land.	do 15.	400	30	do 30.	do 26.	7	3	0	W	....	L
Grant's Favourite	Buckbee.	do 15.	400	30	do 30.	do 27.	6	2	8	W	T	L
Horsford's Market Garden	Thorb.	do 15.	400	30	do 30.	do 18.	4	1	15	W	D	M
Heroine	do	do 15.	400	30	do 30.	do 20.	6	2	4	W	M	M
Hancock	Greg	do 15.	400	30	do 17.	do 2.	5	2	13	S	M	E
Hair's Dwarf Blue Mammoth	Simm	do 15.	400	30	July 3.	do 31.	6	1	0	W	D	L

GARDEN PEASE—*Concluded.*

Name.	Seedsman.	Date of Sowing.	Number of Seeds Sown.	Length of Row.	Date of Blossoming.	When ready for Table.	Average number of Pease in a Pod.	Yield of Dried Pease in Lbs., ozs.		Kind of Pease—Wrinkled or Smooth.	Height.	Early, Medium or Late.
		1896.		Ft.	1896.	1896.		Lbs.	Oz.			
Juno	Thorb.	May 15.	400	30	July 2.	July 26.	6	2	3	W	M	L
John Bull	do	do 15.	400	30	June 30.	do 26.	6	2	4	W	M	L
Kentish Invicta	Ewing	do 15.	400	30	do 20.	do 7.	5	3	8	S	M	E
King of the Dwarfs	Greg.	do 15.	400	30	do 23.	do 7.	5	3	0	W	D	E
Large Irish White Marrowfat	Land.	do 15.	400	30	July 3.	do 27.	5	2	15	S	T	L
Laxton's Alpha	Ewing.	do 15.	400	30	June 20.	do 11.	5	3	5	W	M	E
do Charmer	do	do 15.	400	30	do 30.	do 26.	6	2	8	W	M	L
do Supreme	Simm.	do 15	400	30	do 30.	do 28.	6	0	13	S	T	L
Long Island Marrowfat	Land.	do 15.	400	30	do 30.	do 28.	7	1	14	W	M	L
Melting, Sugar Edible Pods	Thorb	do 15.	400	30	do 30.	do 28.	6	1	13	S	M	L
Mammoth Gray Seeded Sugar	do	do 15.	400	30	do 30.	do 31.	7	0	14	S	T	L
Marblehead Early Marrowfat	Greg.	do 15.	400	30	do 30.	do 26.	7	3	10	S	T	L
McLean's Little Gem	Thorb	do 15.	400	30	do 23.	do 11.	5	2	6	W	D	E
do Advancer	do	do 15.	400	30	do 24.	do 13.	5	2	6	W	M	M
do Prolific	Ewing	do 15.	400	30	do 31.	do 28.	6	1	12	W	D	L
Nott's Excelsior	Thorb	do 15.	400	30	do 20.	do 7.	5	2	3	W	D	E
Ne Plus Ultra	do	do 15.	325	25	do 30.	do 31.	6	1	5	W	T	L
New Maud S.	Buckbee.	do 15.	400	30	do 19.	do 23.	5	3	8	S	D	L
New Life	Breck	do 15.	400	30	July 1.	do 27.	6	2	8	W	D	L
New Giant Podded Marrow	J. & Stokes	do 15.	400	30	June 30.	do 27.	8	3	0	W	M	L
900 to 1	Land	do 15.	400	30	do 30.	do 27.	6	3	9	S	....	L
New Victory	Rennie	do 15.	400	30	do 30.	do 28.	5	2	4	W	M	L
Premium Gem	Thorb	do 15.	400	30	do 20.	do 13.	5	3	0	W	D	M
Philadelphia	do	do 15.	400	30	do 17.	do 13.	5	3	1	S	M	M
Pride of the Market	do	do 15.	400	30	do 30.	do 28.	7	2	11	S	D	L
Prince of Wales	do	do 15.	400	30	do 29	do 20.	5	2	3	W	M	L
Paragon	Dreer	do 15.	400	30	do 30.	do 20.	5	2	3	W	T	L
Profusion	Breck	do 15.	400	30	July 2.	do 28.	5	1	9	W	T	L
Petit Poise, or Small E'y French	Farquhar.	do 15.	400	30	June 29.	do 18.	5	2	5	S	M	M
Phonograph	Land	do 15.	400	30	July 8.	do 26.	6	2	0	S	T	L
Queen	Thorb	do 15.	400	30	June 30.	do 28.	7	1	11	W	M	L
Rural New Yorker	do	do 15.	400	30	do 20.	do 20.	5	3	11	S	M	M
Station	do	do 15.	400	30	do 20.	do 20.	5	1	15	W	D	M
Shropshire Hero	do	do 15.	400	30	do 30.	do 26.	5	2	0	W	M	L
Sander's Marrow	do	do 15.	400	30	July 8.	do 26.	6	1	6	W	T	L
Stratagem Improved	do	do 15.	400	30	do 2.	do 24.	5	0	12	W	D	L
Stanley	Dreer	do 15.	400	30	do 2.	do 28.	7	1	4	W	D	L
Startler	Buckbee	do 15.	400	30	do 3.	do 27.	5	1	8	W	M	L
Sunol	Gregg	do 15.	400	30	June 17.	do 16.	5	3	0	S	M	M
Sharpe's Queen	Breck	do 15.	400	30	do 30.	do 29.	6	1	0	W	D	L
Sutton's Satisfaction	J. & Stokes	do 15.	400	30	do 29.	do 26.	5	2	10	W	M	L
Thorb. Ex. Ey. Market	Thorb	do 15.	400	30	do 17.	do 3.	5	3	7	S	M	E
Tom Thumb	do	do 15.	400	30	do 20.	do 5.	5	2	11	R	D	E
Telegraph	do	do 15.	400	30	do 29.	do 26.	6	2	6	S	T	L
Telephone	do	do 15.	400	30	do 29.	do 27.	7	1	15	W	T	L
Tall White Edible Pods	do	do 15.	400	30	do 29.	do 27.	7	1	11	S	T	L
Veitch's Perfection	Ewing	do 15.	400	30	July 3.	do 27.	5	0	11	W	M	L
do from W. Wilson, Port Arthur, Ont.	......	do 15.	400	30	do 2.	do 27.	6	2	7	W	T	L
White Marrowfat	Thorb	do 15.	400	30	do 6.	do 31.	7	2	4	S	M	L
William Hurst	Dreer	do 15.	400	30	June 20.	do 13.	6	3	4	W	D	M
Yorkshire Hero	Thorb	do 15.	400	30	do 30.	do 31.	5	3	10	W	M	L

GROWING CELERY IN BEDS.

A good deal has been said and written about the advantages of "bed culture" of celery, over the ordinary single, or double row system. Celery has been grown both in beds and in rows for the past three years at the Central Farm. Some data regarding the condition and yield of eight varieties grown in beds this year is given below. The bed system is undoubtedly to be recommended to those who have but a small area that may be devoted to the cultivation of this vegetable, which I may venture to remark parenthetically is largely neglected and unappreciated by farmers. There is much less labour involved when celery is grown in beds than if grown in single or double rows,—banking up being unnecessary. In order to secure satisfactory results, an abundance of manure and water is needed. Without these the plants will be small, stringy in quality and spindling in appearance. The water question is the main drawback; the draught on the soil moisture is heavy. It is unsafe to depend upon the average rainfall. The plants in this experiment were watered on an average twice a week, by using the garden hose.

How to grow.—Sow the seed in a hot bed or cold frame about the middle of April. It will be ready for pricking out into rows two inches apart each way about a month later. If it is not pricked out the young plants should be cut back to give stockiness. In this experiment the plants were set out on June 27th. Hot bed frames were used, additional soil being added until a covering 6 to 8 inches was laid over the now well settled manure. The plants were set approximately 7 x 7 inches apart. They grew somewhat slowly at first, but soon covered the ground and made a vigorous growth till arrested by autumn frost. The sides of the frames were 12 inches high. This furnished the requisite amount of shade. The early varieties were well blanched when taken up, while the late kinds needed further blanching to make them suitable for market, though they were in good condition for storing. As stated before, it was found that such a large number of plants upon a comparatively small area sucked up the moisture so rapidly that it was necessary, in order to preserve them in a healthy growing condition, to irrigate the beds at least once a week, and sometimes twice. "Celery leaf rust" was controlled by spraying with Bordeaux mixtures.

The seed was sown in hot bed, April 7; plants pricked out, May 12; planted out, June 27; harvested, October 22.

Paris Golden Yellow, White Plume and Boston Market are three excellent varieties, and mature in the order in which they are mentioned.

YIELD OF CELERY GROWN IN BEDS.

Variety.	Seedsman.	Area Occupied.	No. of Plants.	Height when Harvested.		Total Weight in Lbs.		Average Weight of Stalks.		Condition when Harvested.
		Sq. ft.		Ft.	In.	Lbs.	Ozs.	Lbs.	Ozs.	
White Plume..........	Thorb'n	27	80	2	6	141	0	1	12	Well blanched and fit for table.
New Pink Plume	Hend'n.	48	141	2	6	224	0	1	9	Not so solid as White Plume; well blanched.
Covent Garden Rose ..	Thorb'n	13	40	2	8	75	0	1	14	Considerably rusted; unblanched.
Giant Paschal.........	do	20	60	2	11	116	8	1	15	Solid; slightly blanched.
Boston Market........	Steele ..	40	120	2	6	258	8	2	2	Unblanched; numerous side shoots; these slightly blanched.
London Red...........	do ..	40	120	2	8	277	0	2	4	Only slightly blanched; large, solid heads.
Paris Golden Yellow..	do ..	34	100	2	0	228	0	2	4	Handsome, well blanched, crisp; free from disease.
Golden Self-Blanching.	Thorb'n	34	100	2	0	196	0	1	15	Healthy and solid; well blanched.

Tobacco plantation in August, Central Experimental Farm.

TOBACCO CULTURE.

The first lot of seed sown at the usual time, towards the end of March, failed to germinate satisfactorily. This necessitated a second sowing which resulted in giving strong plants, but much too late for this locality. The varieties tried were White Burley, Yellow Pryor, Canadian and Cannelle (Quesnel). After setting them out on June 10 the plants made a rapid and satisfactory growth. White Burley matured first and was partly harvested when the killing frost of September visited the field and practically destroyed the later varieties. The situation was somewhat low and the frost effects were, therefore, severe. The accompanying illustration from a photograph gives a correct impression of the character of the growth. Tobacco plants should be strong and vigorous and fit for transplanting in this locality by May 15th, in order to ensure the crops against autumn frosts. The following sensible instructions offered to planters by Mr. C. E. Archibald, manager of the Empire Tobacco Co., Granby, Que., are submitted for the guidance of tobacco growers.

POINTS IN REFERENCE TO GROWING TOBACCO.

(*By C. E. Archibald, Granby, P.Q.*)

It is necessary to start the plants in a hot-bed or cold frame. The bed, if unprovided with bottom heat, should be carefully prepared in good, rich soil, if possible on a hill sloping towards the south-west. First cover the intended bed with refuse wood, and burn it, so that all foreign seeds in the ground may be killed, then spade the ashes under, and make the ground light and pliable. Then carefully sprinkle the seed over the ground and press it under with the foot. In about 6 or 7 weeks plants should be large enough to transplant to your field, which should in the meantime be carefully prepared to receive them. (Ploughed and harrowed). When plants are about 4 or 5 inches tall, take advantage of a rain and "draw" the plants from the plant-bed (without breaking the roots) and transplant to the field. Pryor tobacco is planted $3\frac{1}{2} \times 3\frac{1}{2}$ feet, but White Burley may be set somewhat closer. If the ground is very rich and strong 20 x 40 inches is about right for Burley, having the wide row running north and south, so that each plant may get the maximum amount of sun.

If the ground is not very strong set the Burley 30 x 40 inches. The Pryor plants should be topped leaving 10 or 12 leaves on each plant. This means that when that many leaves have grown out from the stalk, the top of the plant must be pinched out, and any suckers which may appear afterwards must be taken off close to the stalk.

White Burley plants are topped at 16 to 20 leaves to prevent the tobacco from being too heavy in body.

Never cut tobacco on a rainy day, as it is sure to get full of sand, and the rain is very likely to affect the curing of it. One great trouble with the leaf grown in Canada is that it contains more or less sand, therefore great pains should be taken in seeing that the bottom leaves are taken off before cutting the plant, as these usually contain more sand than the other leaves, owing to the rain striking on the ground and splashing it against the lower leaves. When the plant is cut it should not be thrown on the sandy soil, but upon a suitable rack, as in handling it in this way it is sure to collect sand.

A properly constructed drying barn should be prepared to receive the leaf after it is cut. This barn should be well ventilated, so as to take off the moisture that comes from the green tobacco. A very good way to arrange for this is to have boards hinged horizontally along the bottom part of the sidewalls with the ventilator in the top of the barn, so that the air may enter below, pass through the leaves and out the ventilator on the top.

In "striking" the leaves from the stalks, (after drying) great care should be exercised to select and tie up the different qualities by themselves, not tying too many leaves in a hand. Be sure and see that after tying the leaf into hands, that it is in good keeping order, for should it be put away in wet order mould will very likely destroy the leaf.

Growing Tobacco Leaf for Special Purposes.

For Plug Tobacco Wrappers.—Should be dark, heavy bodied waxy leaf, cured without heating, so as not to make it tender, but rather cured so as to make it as tough as possible, and free from broken leaf or leaves having holes in them.

For Plug Tobacco Fillers.—This should be grown with a heavy body, not thin or papery in texture It is really necessary that the leaf should be of good, bright, rich colour, as dark fillers are not acceptable. White Burley is the best for fillers, but thin, bright, yellow leaf Burley is not acceptable, as it is usually bitter; while it might be used for smoking tobacco, it is not suitable for plug chewing.

Cigar Wrappers.—Should be grown thin and as silky as possible. The leaf should be free from white or large veins, and be of a glossy nature, so as to give the cigars a handsome appearance when covered; must not be tender, but of a good "stretchy" nature.

Cigar Binders.—Should be about the same as wrappers, but need not be free of white veins, nor glossy, as dry colours can be used for that purpose.

Cigar fillers should, I think, be grown from Havana seed, and for this purpose it would be better to have the leaf of a much smaller size than the leaf used for other purposes. In fact, if it could be grown from 6 inches to 10 inches long, it would be better than a larger leaf.

All should be free of sand. This is most important.

REPORT OF THE CHEMIST

(Frank T. Shutt, M.A., F.C.S., F.I.C.)

Ottawa, 15th December, 1896.

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the tenth annual report of the chemical division of the Dominion Experimental Farms.

Many of the investigations begun in previous years have been continued, and several new lines of experimental research have been entered upon. The results now given add considerably to our store of knowledge, and it is believed will prove of value to Canadian agriculturists, for it has been our constant aim to make the work undertaken both accurate and practically useful. That which is now reported on may be outlined briefly as follows :—

Soils.—Data are presented showing the composition of certain virgin soils in British Columbia. Six of the samples are from a comparatively large unmanured, uncropped and practically unsettled area, extending over two degrees of latitude and lying between the Rocky Mountains and the Coast Range, and known more particularly as the Cariboo district. Three of the samples were from Chilliwack, on the Fraser River, and are indicative of the character of certain soils of that district. The analytical results are accompanied by an explanatory account of the data, together with suggestions for economic methods of treatment of the soils.

As in past years, very many samples of soil have been received during 1896 from farmers. Since these, for the most part, were taken from cultivated fields, their complete analysis was not undertaken. They were, however, submitted to an examination, which in most instances consisted in a determination of humus, nitrogen and lime and the relative proportions of clay and sand. The physical condition or tilth under varying circumstances is also usually ascertained. None of these samples are here reported, but the senders have been furnished with the particulars of the examination, together with methods of manuring and tillage that seemed best suited to the soil under consideration.

The question of the improvement of muck soils has received some attention. Results obtained in pot experiments, using various mineral manures, are stated, which go to show the value of potash and lime for these soils. This chapter is illustrated by reproductions of the photographs of the growing vegetation.

Mucks and Muds.—The analyses of eleven samples of muck are given. The character and uses of this material as a nitrogenous fertilizer are stated for the guidance of those to whom muck deposits are accessible. Several samples of pond mud have also been examined and their fertilizing value here commented on. The composition of an alluvial deposit occurring in large quantity at the mouth of the Desbarats River, Algoma, has been ascertained and forms the subject of a chapter.

Manures and Fertilizers.—Some instructive results obtained by fermenting manure for one year in a shed are given. This investigation shows that there was considerable loss of fertilizing constituents during that period.

An experiment to ascertain the effect upon finely ground mineral phosphate by mixing it with strongly fermenting manure was made. The results show that practically no phosphoric acid was thereby made available.

A further contribution to our knowledge concerning the value of the clovers as green manures is made. The data give the composition of the foliage and roots, as well as the approximate amounts per acre of the essential constituents contained therein. Alfalfa, Crimson Clover, Mammoth Red Clover and Common Red Clover are the varieties now reported on.

An analysis of the foliage of Prickly Comfrey is given, and the amounts of nitrogen, phosphoric acid and potash abstracted from the soil by the plant per acre stated.

The percentages of potash and phosphoric acid in commercial samples of Maple and Basswood ashes have been determined and are here recorded. While the former is richer in potash, the latter contains the larger amount of phosphoric acid. The quantities of these elements soluble in 1 per cent citric acid, as showing the probable percentage of availability, has also been ascertained,

Three samples of garbage ashes as produced at city crematories have been analysed and their fertilizing value is herein discussed.

The percentages of potash and phosphoric acid in wheat bran ash, as obtained from the use of bran as a fuel in mills in Manitoba, have been ascertained. This material is shown to be exceedingly rich in the mineral elements of plant food.

The agricultural value of broken oyster shells is discussed, data respecting the composition of this material being presented.

Fish meal or guano is treated of ; its composition and best methods of use being stated.

To answer frequently occurring inquiries, the composition of commercial fertilizers, other than manufactured brands, is presented in tabular form.

Fodders.—It is with no little satisfaction that we are able to present in the present report an account of the chemistry of the Indian Corn plant. This work has been in progress during the past three years. It is thought that the results obtained, and here discussed, will be found of practical value to those who grow this fodder plant, for preservation either in the dried condition (as in stooks) or in the silo.

The relative feeding value of certain varieties of turnips has received attention, and interesting data on this subject are herein set forth.

The composition of several brands of oil cake and germ meal has been determined, and a chapter is devoted to the consideration of these concentrated feed stuffs.

We have also reported on Lacteo-Vitulene, a calf-meal imported from France, regarding which requests had been made as to its composition and value.

The analysis of dried hop vine, undertaken by special request, shows it to be of no value as a fodder.

Well Waters from Farm Homesteads.—As in past years, this useful and, I may add, educational work has been continued. The results show plainly that on many farms polluted water is being used. The interest in the question which we have served to awaken by this investigation, however, continues to grow and we may confidently believe that a better condition of the farm water supplies is being brought about.

Foundation Comb.—The results of the past year's investigation into the relative merits of certain brands of foundation comb will be found, as usual, incorporated in the Report of the Botanist and Entomologist.

Tuberculin.—The diluted tuberculin supplied by the Department of Agriculture has been, as in the past, prepared and forwarded from the farm laboratories. From 6th July to 30th November 10,230 minims were sent out. The record of the amount sent out previous to July was destroyed in the fire.

Fire in the Laboratories.—About 6 o'clock on the evening of 6th July a disastrous fire broke out in the special laboratory, caused by the accidental breaking of a flask containing boiling sulphuric acid—the operation being the determination of nitrogen in an organic substance by the Kjeldahl process. Although strenuous efforts were made to confine the fire to the room in which the accident occurred, they were without avail, and the flames, owing to the inflammable character of the contents of the laboratory and of the lining or sheeting of the walls and ceiling, soon spread to the general laboratory.

Within a few minutes after the outbreak a large number of farm men were working hard to extinguish the flames, which, thanks to the active efforts of this volunteer fire corps and the fact that a hydrant was conveniently located outside the building, were soon overcome. Most unfortunately, Mr. Wm. Taylor, foreman of the Horticultural Division, who worked assiduously and bravely from the first, was very badly burnt about the face and hands ; so serious indeed were his burns that he has not yet fully recovered therefrom.

Nearly all the apparatus that was on the shelves and tables was destroyed and the special laboratory completely gutted. The general laboratory was severely damaged—and for the time being was rendered useless for work. A special appropriation being at once made for the temporary fitting up and equipment of the laboratories, we were able to resume analytical work within a few weeks of the date of the fire, and, although much crippled, we have accomplished a considerable amount of useful work during the latter half of the year.

Our greatest loss was in records and samples. Of the former, those of the analyses of grasses—probably over 100—grown on the Central Farm, comprise the most serious. Many other valuable data of work in progress were also burnt. The samples of soils, fodders, &c., the accumulation of nine years, being kept in the special laboratory, were for the most part destroyed.

It seems highly desirable, from all points of consideration, that a separate building of a fire-proof character should be erected for the chemical work. Our own experience and that of experiment stations and universities all support this as the safest and best plan. It may be added that the erection of a separate laboratory building on the Central Farm would give that increased accommodation in the general building now so greatly needed by the other officers of the staff.

Samples Received.—Owing to the destruction of the records by the fire referred to, it is impossible to state how many samples were received for examination during the past year. Since the date of the fire, 6th July, to 30th November 123 samples have been received.

Correspondence.—The answering of correspondents' inquiries continues to be an important branch of the work of the Division. Between November 30th, 1895, and November 30th, 1896, 1,116 letters were received and 1,047 letters despatched. Since many of the questions necessitate consultation with works of reference and modern agricultural literature, the writing of letters involves a considerable expenditure of my time.

Meetings Attended.—Among the more important agricultural conventions addressed in 1896, were those of the Ontario Creameries Association, held at Cornwall, Ont.; the District of Bedford Dairymens' Association at Cowansville, Que.; the Dairymens' Association of the province of Quebec at Waterloo, Quebec. A lecture reviewing the work accomplished by the Chemical Division since the institution of the farm, was delivered as one of the Somerville course in Montreal. Several Farmers' Institute meetings were attended and papers were specially prepared for the conventions of the Horticultural Societies of Ontario and Quebec and the Beekeeper's Association of Ontario.

Many of the analytical data contained in this report, are the result of the labours of the Assistant Chemist, Mr. Henry S. Marsh, Associate of the Institute of Chemistry. In acknowledging my indebtedness and thanks to Mr. Marsh for efficient help in the laboratory, it gives me much pleasure to again record my testimony to the interest he has taken in the work of this Division.

I have the honour to be, sir,
Your obedient servant,

FRANK T. SHUTT,
Chemist, Dominion Experimental Farms.

VIRGIN SOILS OF CANADA.

BRITISH COLUMBIA.

The analytical data obtained from an examination made in laboratories during the past year of certain soils from the province of British Columbia are here presented in tabular form.

Soils, Nos. 1 to 6 were forwarded by Mr. H. P. Bell, C.E., of Victoria, B.C., who writes that the samples "belong to a very large uncropped, unmanured and practically unsettled area, extending from the Rocky Mountains to the Coast Range through more than two degrees of latitude being part of what is known as the Cariboo District." They were obtained on an exploration survey made in the summer of 1895, and Mr. Bell adds: "their analysis would furnish useful information for the report of the exploration referred to." On account of the thoroughly representative and important character of these samples, (as vouched for by Mr. Bell), it was deemed advisable to submit them to complete analysis.

The following information respecting these soils is furnished by Mr. Bell: "the depths of surface and sub-soils are variable. In natural meadows—of which there is a large area, particularly west of the Upper Fraser River and east of the Coast Range—the surface soil is deep, and in other places (high plateaux, for instance), it varies from six inches to several feet in depth, as seen by upturns of trees and natural exposures." There is no drainage other than that of nature within the district referred to. Mr. Bell proceeds, "Throughout the settled portions of British Columbia, along the upper benches of the Fraser River Valley, all the farmers that I have spoken to say that the upper benches of the river afford the best soil and grow the heaviest crops, and that the lower benches require irrigation in order to farm them profitably." The writer here no doubt refers to the valley of the Upper Fraser in the Cariboo District.

Regarding the suitability of the soils as grazing lands Mr. Bell writes: "There are many kinds of indigenous grasses in British Columbia, many of which I have seen grown from seed near Tatla Lake, in a natural meadow, the growth being very luxuriant. I have seen a thick growth of clover upon soil that appeared to be the same as the samples sent, so far as an unskilled person could judge. I may add that if the soils I have sent you prove to be suitable for the growth of indigenous grasses of the kind referred to, or others of good quality, the fact would have an important bearing upon the future prospects of a large area of grazing country."

Soils Nos. 7, 8 and 9 are from Chilliwack, in the valley of the Fraser, and were furnished by Mr. H. Kipp, of that place. In my report for 1893 will be found the results of an analysis of a muck soil and its sub-soil from the farm of Mr. Chapman, of Chilliwack, lying between the mountain range and the river. The upper layers of that soil, varying from two feet to four feet, proved to be exceedingly rich in humus and nitrogen; and the sub-soil was a heavy clay containing nitrogen above the average found in sub-soils, a fair amount of mineral plant food, but somewhat deficient in lime. I then reported concerning the soil: "Good drainage, a certain admixture of the sub-soil and an occasional application of wood ashes and lime or marl, are all that are necessary to ensure abundant crops, providing the climatic influences are favourable." The surface soils analysed this year, and now reported on, are of a widely different character from the one just referred to, possessing much less humus and nitrogen and containing a larger proportion of sand and clay. There are, however, resemblances between the soil underlying the surface muck soil (examined in 1893) and those whose composition is now given, the chief being the very high percentage of oxide of iron and alumina possessed by these soils.

The analytical data are now presented in tabular form:—

ANALYSES of Soils (air-dried), 1896.

No.	Soil.	Locality.	Water.	Organic and Volatile Matter.	Clay and Sand.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Soda.	Phosphoric Acid	Soluble Silica.	Carbonic Acid. (Undetermined.)	Total.	Nitrogen.	Clay and Fine Sand.	Coarse Sand.
1	Surface...	Fraser River benches, east side of Quesnelle mouth..	3·26	11·62	46·95	7·65	17·19	1·55	·37	·16	·21	·09	10·95	100·00	·386	25·71	21·24
2	Sub-soil ..	do do do ..	2·05	4·51	74·50	10·94	3·73	1·88	·52	·20	·19	·17	1·31	100·00	·106	35·78	38·72
3	Surface...	Cottonwood River, near Bond's House, 20 miles past Cariboo Road..............................	2·45	8·08	77·97	8·08	1·11	1·15	·31	·07	·33	·11	·34	100·00	·228	17·62	60·35
4	Sub-soil ..	do do do ..	1·00	3·00	83·90	9·63	·98	·75	·36	·15	·28	·05	......	100·10	·057	9·17	74·73
5	Surface...	Farm at Cottonwood House......	5·38	12·34	65·80	12·59	1·01	1·89	·54	·07	·23	·06	·09	100·00	·390	12·02	53·78
6	Sub-soil .	do do	·83	2·99	82·10	10·34	1·21	1·8[illegible]	·46	·12	·10	·11	......	100·09	·049	6·07	76·03
7	Surface...	Chilliwack....................	1·80	7·58	71·41	17·50	·96	·12	·62	·19	·21	·05	.. ..	100·41	·163	33·71	37·70
8	Sub-soil ..	do	1·70	5·81	73·90	16·80	·89	·05	·50	·21	·22	·05	.....	100·13	·106	26·10	47·80
9	Surface...	do	2·66	5·32	75·39	14·00	1·20	·33	·39	·21	·22	·07	·21	100·00	·115	24·19	51·20

For a proper understanding and interpretation of these results, it will be necessary, even at the risk of repetition, to present a statement respecting the amounts and functions of soil ingredients and the factors that conduce to a soil's fertility. This will be made as brief as possible, the reader being referred to previous reports for a more detailed account.

CHEMICAL COMPOSITION OF SOILS.

Organic Constituents.—Humus or semi-decayed vegetable matter, though not in itself direct plant food, plays a most important part in soils. Its presence in right proportions improves the physical condition of a soil, chiefly in that it regulates its temperature and degree of moisture. By the decomposition of humus, carbonic acid gas is liberated, which in turn sets free mineral plant food in the soil. Further, it has recently been shown that it is in combination with humus that certain of the mineral constituents of plant food are more particularly available to crops. It would appear that we have not in the past duly recognized the fertilizing value of these humic compounds.

Nitrogen.—An element of great value agriculturally, and contained to a very large extent in the humus in a condition not immediately available for plant use. Nitrification, or the conversion of this nitrogen into soluble forms, is brought about by the agency of micro-organisms known as bacteria, ferments, &c. The presence of lime, good tilth and suitable climatic conditions of moisture and warmth, are the factors that are favourable to their development. The total nitrogen in a soil of good average fertility lies between ·2 per cent and ·5 per cent—though there are many soils yielding lucrative crops, the nitrogen of which falls below ·2 per cent. Very rich soils contain between ·5 per cent and 1·0 per cent of this element.

Inorganic Constituents.—These comprise principally lime, magnesia, oxide of iron, alumina, potash and soda, combined with silica, phosphoric, sulphuric, hydrochloric and carbonic acids. They are present in a soil by reason of the disintegrating action of atmospheric and other agencies upon the rocks, which at one time entirely covered the earth's surface, the material so formed being now the inorganic and mineral portion of the soil.

Of the above named elements, potash and phosphoric acid must be regarded by the farmer as the most important, since, although the others are equally essential to the life of the plant, it is the available store of these two that continuous crop growth more particularly depletes, and, therefore, that the agriculturist must seek to restore in order to maintain and increase the soil's fertility.

Potash is present in the soil as a result of the decomposition of the originating granite or other felspathic rock. It exists there chiefly in an insoluble condition. Digestion of a soil with hot, strong hydrochloric acid, by the method agreed upon by the Association of the Official Agricultural Chemists of the United States, yields, as a rule, potash between ·1 per cent and 1·5 per cent. Good agricultural soil possesses on an average between ·25 per cent and 1·0 per cent ; soils in which clay predominates are usually the richest in potash.

Phosphoric Acid.—Also derived from the disintegration and decay of the rocks forming the inorganic basis of the soil. The percentage of this constituent, as determined by the method already referred to, varies usually between ·15 per cent and ·5 per cent.

Lime ranks next in importance amongst the inorganic elements of plant food. Directly and indirectly, lime is of great service to growing crops, and many agricultural authorities place the minimum limit in a soil for good returns at 1·0 per cent. The presence of lime encourages nitrification of the humus and also sets free inorganic elements of plant food.

Tilth.—The degree of availability of plant food is no doubt largely regulated and controlled by the soil's tilth, since the rendering assimilable of the mineral and nitrogenous compounds is due chiefly to bacterial and atmospheric agencies, which for

their action are dependant upon a soil's mechanical condition. Concerning tilth, it may be well, therefore, to make the following abstract from our report of 1895 :—

This is a factor of great importance to a soil's productiveness. A good tilth includes the following qualities : retentivity of moisture, of warmth and of soluble fertilizing material, permeability to air and water, freedom for root extension, stability and strength with friability.

These properties are largely dependent upon the relative amounts of a soil's ingredient's—clay, sand, humus, &c. Dr. Fream, in his work entitled "*Soils and their Constituents*," says (page 101) that "experience proves that a soil is best adapted for the purposes of cultivation when it contains of :

Sand (siliceous and calcareous)................	50—70	per cent.
Clay....................................	20—30	"
Pulverized limestone.........................	5—10	"
Humus (semi-decayed vegetable matter).........	5—10	"

"It thus contains enough sand to make it warm and pervious to air and moisture ; enough clay to render it moist, tenacious and conservative of manures ; enough limestone to furnish calcareous material and to decompose organic matter, and lastly, sufficient humus to assist in supplying the alimentary needs of the plant and to aid in maintaining the carbonic acid in the interstitial air of the soil."

Finally, the culture that a soil receives has necessarily much to do with its tilth. Underdraining, ploughing, harrowing, rolling and other mechanical operations are the means that the skilful farmer uses in bringing about a favourable and fertile seed bed. These operations must be considered as equally essential with the manuring of the land, for they not only conduce to improved tilth but indirectly add to the soil's store of available plant food.

REPORT ON SOILS EXAMINED.

Soil No. 1.—Fraser River benches, east side of Quesnelle River mouth. Upper or surface soil. When air-dry, a dark gray, sandy loam, friable, easily crushed, apparently rich in humus, homogeneous and of good tilth.

This soil, as judged from its chemical composition and mechanical condition, should prove exceedingly fertile. In potash and phosphoric acid it contains good averages ; of lime it has an abundance, and humus (semi-decayed vegetable organic matter) and nitrogen are present in amounts equal to those found in some of our finest Canadian soils, and indicative of excellent crop-producing power.

Soil No. 2.—Is stated to be the sub-soil of the above. In certain marked particulars it differs from No. 1, so that there is some doubt in the writer's mind as to whether it was taken from the same spot as No. 1. The principal feature in this connection is the much smaller percentage of lime in No. 2 sample. Considered as a sub-soil, this sample possesses very fair amounts of plant food, both mineral and organic; in potash it surpasses the surface soil, though probably the potash in the latter is the more available.

Soils Nos. 3 and 4.—Upper and lower soils, respectively, from benches on the Cottonwood River, near Bond's house, 20 miles past Cariboo road. No. 3 consisted of yellowish sand with lumps of darker coloured sand and some root fibres. The sample was not homogeneous, and from appearance would be said to be a poor soil.

The chemical data, however, show it to be tolerably rich in all the essential elements of fertility. From the standpoint of its composition, this soil compares well with many from British Columbia, examined in our laboratories, that have proved, under favourable climatic influences, capable of producing paying yields.

The sub-soil No. 4 has the appearance of being almost pure sand ; it, nevertheless, contains notable amounts of mineral plant food, though very poor in humus and nitrogen. In lime, both these soils approximate the lowest limit generally given by agricultural chemists for good results ; in this respect they differ materially from the soils already considered.

Soils Nos. 5 and 6.—Are the upper and lower soils from the farm at Cottonwood house. No. 5, a dark gray, sandy loam, but not homogeneous throughout, containing some undecomposed root fibres. Its appearance would indicate a somewhat larger percentage of clay than that in No. 3. In humus and nitrogen it is very similar to soil No. 1, being above the average. It contains a good store of potash and a fair amount of phosphoric acid. The percentage of lime, however, only reaches the limit already referred to. The chief differences between No. 1 and this sample are that the latter contains less clay and lime and more potash and iron.

The sub-soil No. 6 is of a yellowish gray colour, and appears from a near inspection to be almost pure sand. The chemical results corroborate this conjecture, for with the exception of potash which is present in a fair quantity, this sample is very poor in all those constituents which go to make a soil fertile. An inspection of the figures show that in many respects there is a strong similarity in composition between this sample and sub-soil No. 4.

Soils Nos. 7 and 9, from Chilliwack, are of medium quality, the former being slightly the richer of the two in nitrogen and potash. Both are deficient in humus and its concomitant nitrogen, and consequently would be benefited by organic manures, *e. g.*, barnyard manure or the turning under of a green crop, preferably, one of the legumes. The addition of lime would probably give a profitable return, as the percentage of this element is low in both soils. Soil No. 7 is heavier, *i. e.*, contains more clay than No. 9, and I should judge would be better adapted for cereals and fruit crops.

The sub-soil No. 8 presents no striking features. It possesses much less lime, more iron and more sand than sub-soil No. 2, but in potash, phosphoric acid and nitrogen they are almost identical.

It is to be regretted that our disastrous fire destroyed the data obtained on the availability of the plant food in these soils, which had being determined according to the citric acid method of Dr. Bernard Dyer, as outlined and explained on pages 201 et seq. of my last report.

THE IMPROVEMENT OF MUCK SOILS.

These soils consist chiefly of vegetable organic matter, and are further characterized by a high percentage of nitrogen. Frequently, the sand, clay and other mineral matter together do not exceed 12 per cent of the air-dried soil, and indeed many samples examined by us proved to contain much less. It is very evident, therefore, that organic and nitrogenous fertilizers, such as barnyard manure, are not needed by these soils, and experience has shown that it is not economical to apply them. Their chief deficiency is in the mineral constituents of plant food, and consequently they are found to respond to dressings of wood ashes, lime, &c.

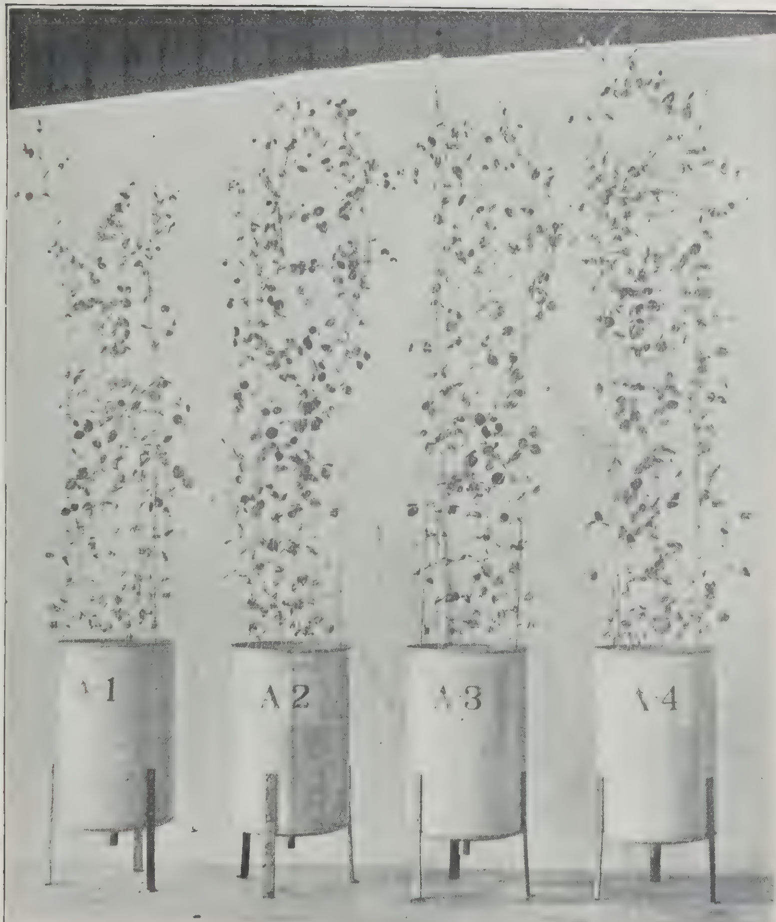
Such fertilizers not only furnish the necessary and lacking elements for vigorous growth, but correct the natural sourness of these soils by supplying a salifiable base for the organic acids present in the muck. Since agricultural crops cannot flourish in an acid soil, the part that lime, potash and other bases play in this respect is by no means an unimportant one.

Further, an application of these fertilizers encourages the nitrification of the organic matter of the soil. The minute organisms that convert the nitrogenous matter of the muck into the nitrites and finally into nitrates—the form in which plants can utilize soil nitrogen—only flourish in a neutral or slightly alkaline soil.

To illustrate the value of this treatment a series of pot experiments has been carried on during the past two years.

The soil used in this investigation had the following composition when received:—

Water	67·50
Organic matter	24·99
Mineral matter or ash	7·51
	100·00
Nitrogen	·71



Pot experiments with peas sown in muck soil, with and without wood ashes.

To the pots were added wood ashes and lime according to the subjoined scheme, pease being sown in all cases. At the close of the experiments the weights of the crop were ascertained and the photographs, here reproduced, taken. The first trials were made in the winter of 1895, the pease being sown in November and the crop harvested in March. The second series were conducted out of doors from May to July of the present year. The annexed table gives the particulars of the investigation :—

—	Weight of Produce in Grams.	
	First Series.	Second Series.
Pot A. 1.—Muck soil, no fertilizer	21	79
" 2.—Muck soil + wood ashes at the rate of 100 bushels per acre	32	83
" 3.—Muck soil + wood ashes at the rate of 50 bushels per acre + marl at the rate of 50 bushels per acre	28	82
" 4.—Muck soil + wood ashes at the rate of 200 bushels per acre	35	87

A similar number of plants was grown in each pot.

The figures and the photographs both confirm the opinion already stated that muck soils may be much improved in fertility by the addition of potash and lime.

It may be well to again emphasize the importance of thorough drainage of these soils. This is absolutely essential. The soil thereby becomes firmer and more compact, and thus better adapted to the growth of crops. Wherever possible, a mixture of the sub-soil should be made. If this is not practicable, a dressing of clay and sand will be attended with profit.

With rational treatment, muck soils give excellent returns with vegetable and root crops; oats, timothy and other grasses also thrive well.

Wood ashes may be obtained cheaply in many parts of Canada; but, if so desired, kainit or muriate of potash may be used to supply potash. With such, superphosphate should be applied to furnish phosphoric acid. Marl occurs in large deposits in many districts, but when difficult to obtain, lime may be applied as such without involving any great expenditure.

SWAMP MUCK.

The value and uses of this material, after proper treatment, as a nitrogenous fertilizer, have been stated in former reports; but since there is a keen interest in this subject, in many parts of Canada, at present, it will be well that the table given of analyses of mucks made during the past year, should be accompanied by a short account of the various ways in which this naturally occurring fertilizer may be employed with advantage.

The terms swamp muck, black muck or, simply, muck, have been applied on this continent to the partially decayed vegetable matter, originating and accumulating in low places and hollows, by the death of successive generations of aquatic and semi-aquatic plants and preserved by the presence of water. During the growing season muck swamps usually are thickly covered with a luxuriant vegetation, principally moss and ferns, which as the year proceeds will die down and add to the underlying store of humus, making way for a new growth the following spring.

These deposits are frequently many acres in extent and vary in depth from a foot or two to ten or fifteen feet, or even more.

As regards composition, muck is largely organic matter, a part of which, by decay, has passed into that condition known as humus. The percentage of clay, sand or other inert matter is usually small, frequently less than 2 per cent in the air-dried material. As dug from the swamp, the amount of water is not unusually between 70 per cent and 80 per cent.

The agricultural value of any particular sample of muck is dependant upon the percentage of nitrogen and the amount of humus it contains and its state of decomposition. In the air-dried material, the water is usually below 15 per cent, organic matter between 50 per cent and 70 per cent and the nitrogen between 1·5 per cent and 2·0 per cent. The limits are so wide that these data are given merely to indicate the general character of the average sample.

The data about to be presented corroborate the statement made last year, namely, that the percentage of organic matter (humus) is not always a safe indication of the sample's richness in nitrogen. It is by no means an invariable rule that a large amount of vegetable matter means a high percentage of nitrogen, and, therefore, as we must consider the chief value of muck to be in its nitrogen content, the importance of chemical analysis to determine this constituent becomes apparent.

The functions of humus in the soil are many. Chemically, by its decay, it furnishes food for crops; mechanically, in right proportions, it serves a most useful purpose in bringing about good tilth and improving a soil's absorbtive power for moisture. These questions are discussed fully under the caption of Green Manures in my report of 1895.

Since the organic matter in mucks is found in many stages of decay, it follows that the fertilizing effect of different samples is very variable, but in none of them can we suppose the nitrogen to be in such combinations as to be *immediately* available to crops. Further, the deposits are often distinctly acid or sour (due to the method of formation) and consequently it is frequently necessary to render them alkaline with lime or wood ashes before the process of nitrification (whereby the nitrogen is made available for plants) can be induced. This consideration leads us to the conclusion that while in muck there is a large store of very valuable plant food, but a very small part of it is immediately assimilable and, therefore, it is advisable that some preliminary treatment of the muck be employed to bring about a greater solubility of the elements of fertility before its application to the land.

THE COMPOSTING OF MUCK.

The muck should first be mellowed or seasoned by exposure to the air. By this means a large quantity of useless water may be got rid of, and the muck rendered more friable and less sour. There are occasions when it may be desirable or advisable to apply this crude but mellowed muck directly to the soil, but if circumstances permit it is always wise to first induce nitrification by some process of fermentation.

There are several ways of doing this, and we shall first allude to the treatment by composting with ordinary barnyard manure, as it is a method applicable on all farms and one whereby the weight of manure is increased, and loss of nitrogen from the dung largely prevented. On farms insufficiently stocked or where the soil is light or deficient in humus, composting in this way is strongly to be recommended. The amount of muck best to use depends upon the strength of the manure and the condition and character of the muck, and may vary from two to four loads of the partially dried-out muck to each load of manure. It is not advisable to have so much muck present as to prevent all fermentation—for this would frustrate the chief object in making the compost.

Rich muck composts can also be made with animal refuse of all kinds, fish waste, vegetable matter, garbage and other easily putrescible materials—the object to be attained being preservation of the plant food in these substances and the rendering more available of the elements of fertility in the muck. The compost heap should be kept moist, but not fully saturated with moisture. The more frequent the forkings over, the more rapidly will the rotting be effected.

MUCK AS AN ABSORBENT.

The high absorbent power of air dried peat makes it an exceedingly valuable material for use in the barnyard, pig-pen and other places about the farm buildings, where there is liquid manure likely to go to waste. By the employment of muck in this way much plant food could be saved on many of our Canadian farms—and not only so, but the buildings and inclosures kept clean and probably the well saved from pollution. Regarding its use as an absorbent, a good plan seems to be the spreading or scattering of the peat behind the cows before cleaning the stable in the morning. It will be found that the work of cleaning is thereby facilitated and the amount of manure—which will really be a rich compost—considerably increased. It will be unnecessary to multiply instances of how muck may thus be used upon the farm; they will occur to all who give the matter any thought.

COMPOSTS WITH LIME AND WOOD ASHES.

Fermentation of muck may be induced and injurious acidity got rid of by the addition of certain alkaline materials, such as lime and wood ashes. An old formula, which may serve as a guide, says, for every 100 bushels of peat take 12 bushels of unleached wood ashes. The same composting work may be effected with 10 bushels of quick-lime, but the resulting compost does not contain any potash. The lime should be slaked immediately before use, and for this purpose brine is better than water. When brine is employed (or salt is added to the compost mixture) a small quantity of caustic soda is formed and its presence materially hastens decomposition. Wood ashes furnish potash and, to a less extent, phosphoric acid, thus making the compost a more complete fertilizer. If wood ashes are not to be easily obtained, muriate of potash or kainit should be used. Ground bone will be found an excellent form in which to add phosphoric acid and a readily nitrifiable source of nitrogen to the compost.

It frequently occurs that marl deposits are found in conjunction with muck. When this happens, or marl is otherwise cheaply obtained, it can be used to advantage in the place of lime to compost with muck. Marl (carbonate of lime) is frequently termed mild lime, since its action is slower and less vigorous than quick-lime, nevertheless its alkalinity affords to the muck a condition favourable to the nitrification of the latter.

It may be of interest to append a few formulæ for concentrated composts, since many correspondents have made inquiries for such during the past year. They have been gleaned from several sources and bear the recommendations of practical agriculturists. They should be considered as guides rather than formulæ to be strictly followed, since varying circumstances necessitate, and conditions allow, considerable latitude in making the mixtures.

CONCENTRATED COMPOSTS WITH MUCK.

A—Peat or muck (air-dried)	800 lbs.
Muriate of potash	200 "
Superphosphate	200 "
Bone meal	200 "
B—Peat or muck (air-dried)	800 "
Kainit	200 "
Bone meal	200 "
Quick-lime	150 "
Common salt	50 "

MUCKS ANALYSED, 1896

Of the many samples of muck received for examination during 1896, eleven have been quantitatively analysed as regards their important constituents. They comprise four specimens from Ontario, one from Quebec, one from Nova Scotia and five from Prince Edward Island.

In cases where a qualitative examination sufficed to indicate the approximate value of the muck, further analysis was not undertaken. Reports on these were, however, forwarded to the senders, together with directions for the best use of the muck.

ANALYSES of Swamp Muck (air-dried) 1896.

Number.	Locality.	Sender.	Nitrogen.		Organic and Volatile matter.	Sand and clay.	Mineral matter soluble in acid	Water.
			Per cent.	Pounds in one ton of air-dried muck.				
1	London, Ont	V. Cronyn..........	2·58	51·6	53·52	2·77	11·69	32·02
2	Ompah "	A. Watt..	2·37	47·4	69·59	12·26	10·26	7·89
3	Glen Roy "	W. D. McCrimmon..	2·38	47·6	77·85	0.24	9·86	12·05
4	" "	" ..	2·43	48·6	81·44	0·16	6·72	11·68
5	Lawrenceville, Que. ...	Gervais et frere.....	0·90	18·0	24·65	39 14	12·11	24·10
6	Antigonish, N.S.........	D. G. Kick	2·19	43·8	80·80	1·22	8·30	9·68
7	Albany Station, P.E.I...	W. M. Toombs.....	1·10	22·0	91·71	0·47	1·46	6·36
8	" " ...	"	....	....	89·02	4·29	1·74	4·95
9	Trilby " ...	Chas. Holman.....	0·63	12·6	85·50	5·37	1·95	7·18
10	" " ...	"	0·96	19·2	89·31	0·37	1·79	8·53
11	Alberton " ...	J. B. Champion.....	0·73	14·6	92·02	1·14	0·79	6·05

No. 1.—An excellent sample, rich in nitrogen; suitable for compost or as an absorbent when air-dried.

No. 2.—Dug from the bottom of a dried-up lake. Above the average in its percentage of nitrogen, and would undoubtedly furnish a valuable manure with proper treatment. It could be used to advantage to soak up liquid manure about the farm inclosures and buildings or wherever there may be such material going to waste.

Nos. 3 and 4.—Very similar in composition, containing large amounts of nitrogen and very little inert matter, clay, sand, &c. Representative good samples.

No. 5.—Should prove a very fertile soil, as it appears to be excellent, both physically and chemically.

No. 6.—A very good sample, but requires thorough composting in order to make its plant food available. Clay, sand and other insoluble material present only in very small quantities.

Nos. 7 and 8.—Very fair specimens and could be used with benefit, when previously fermented, to furnish available nitrogen on soils poor in humus.

Nos. 9 and 10.—From a deposit four acres in area and three to four feet in depth. No. 9 from surface; No. 10 from a depth of 12 to 15 inches. Though containing a high percentage of humus, the nitrogen falls below the average in both samples.

No. 11.—From a moss covered bog; moss about one foot thick; muck not run out at a depth of seven and a half feet. Almost entirely composed of semi-decayed vegetable matter. The percentage of nitrogen is below the average, but quite sufficient to make the muck of value as an absorbent and for compost.

POND MUDS.

The agricultural value of these substances is dependent not only upon their composition, but also upon their mechanical effect on the tilth of the soils to which they are applied. None of the samples hitherto examined in the laboratories of the farm have possessed large quantities of plant food, though certain of them have contained nitrogen, humus and lime in fair amounts. The facts in our possession prove that it is exceedingly difficult to pass an opinion upon these materials as a class, since they differ so widely in their composition; their effects on soils of varying character have been found to be widely divergent. Not infrequently has the same mud given good results on one soil and had had no effect in increasing the yield when applied to a soil of a different nature, the latter result probably due in part to an injury of the soil's mechanical texture. I am of the opinion that where profitable results have been obtained from the use of these muds it has been due to two causes. First, the somewhat extreme poverty of the soil to which they have been applied, and, secondly, to the availability, rather than to total amounts, of the plant food they possess. This latter awaits corroboration by chemical investigation.

MUD FROM MIMINEGASH POND, P.E.I.

This deposit is said to be 15 feet in depth. While still wet it is of a yellowish-brown colour; when air-dried, it becomes gray. It appears to be free from all acidity or sourness. The analysis of the aid-dried sample afforded the following results:—

Water	2·24
Organic and volatile matter	13·52
Clay and sand	61·52
Lime	·85
Phosphoric acid	·16
Potash	·48
Nitrogen, in organic matter	·46

The amount of plant food it contains is not large; indeed, it cannot be said to possess any of the essential elements of fertility in notable quantities. Its judicious use, however, more especially on light soils, might give fair returns, but the fact that the mud on drying becomes excessively hard would have the effect of injuring the tilth if applied in heavy dressings to certain soils. The character of the soil has so much to do with the value of a material of this nature, that it is advisable to try it at first on a small acreage.

MUD FROM NEAR SUMMERSIDE, P.E.I.

Many of the analytical data obtained on this sample were lost in the fire; those saved are as follows:—

Water, on air-dried mud	2·45
Clay and sand	72·09
Nitrogen, in organic matter	·37

It is evident that this cannot be regarded as a fertilizer rich in nitrogen, since it only contains 7·4 pounds per ton, even after drying the mud. It is quite possible, however, that the small quantity of plant food it contains may prove more or less available to crops. No great expense should be incurred in obtaining this mud before first ascertaining if it gave profitable results on a small area, since it is in no way comparable to barnyard manure or commercial fertilizers, as supposed by the sender.

POND MUD FROM KINSMAN'S CORNERS, N.S.

Our results of the examination of this sample (air-dried) may be tabulated as follows:—

Water	2·26
Organic and volatile matter	14·20
Mineral matter soluble in acid	16·57
Clay and sand	66·97
	100·00
Nitrogen	·54

The percentage of nitrogen is not high, but the mud undoubtedly contains notable quantities of plant food. Upon soils poor in humus it should, if obtained cheaply, give a fair return, but it should be supplemented by some richer and more quickly acting manure.

DEPOSIT AT THE MOUTH OF THE DESBARATS RIVER, ALGOMA.

A sample of this material was forwarded by Mr. L. O. Armstrong, Colonization Agent of the Canadian Pacific Railway, with a request for an examination as to its fertilizing value. He reports it as occurring in vast deposits. Mr. Armstrong, who has given it a trial on house plants, states that it has been used with marked results.

The chemical data are stated in tabular form as follows:—

Analysis of air-dried Material.

Moisture	4·04
Organic and volatile matter	17·14
Insoluble matter (clay and sand)	63·64
Oxide of iron and alumina	11·64
Lime (equivalent to 2·39 per cent carbonate of lime)	1·34
Magnesia	·74
Phosphoric acid	·24
Potash	·61
Soda	·11
Carbonic acid, &c. (undetermined)	·50
	100·00
Nitrogen	·61

In appearance, when fresh, it resembles a soil rich in organic matter. On drying, by exposure to the air, it becomes a hard mass, which can only be broken with difficulty into lumps. Under the microscope these are seen to be composed of agglutinated sand particles in a matrix of clay, together with roots, leaves and other organic debris.

While not in any measure approaching commercial fertilizers in richness of plant food, the amounts of nitrogen and potash present, it is to be noted, are somewhat above those in average fertile soils. This material should, therefore, be regarded as an "amendment," rather than a fertilizer. On account of its poor physical condition when dry, its application could not be made with safety or advantage to all classes of soils. The best results from its use would most probably be obtained on light, sandy land.

In many respects this material resembles the muds from the mouths of certain rivers in the maritime provinces, many samples of which we have analysed during the past nine years. The exact agricultural value of these deposits is as yet a matter of some dispute. The experiences of intelligent, practical farmers are widely divergent on this matter, and it would appear that the nature of soil to which the "muds" are applied, the amount used per acre, the season, the quantity and character of the fertilizer employed and the kind of crop, are all factors which have largely to do with results. It is possible, however, that the plant food in these deposits is more immediately available

than in an ordinary soil of similar composition, and if this is true their value as fertilizers would be greater than indicated in an analysis which states only the "total" percentages of plant food constituents. It is further probable that the muds differ in the degree of availability of their fertilizing constituents; and, if so, we can readily understand why opinions as to the efficiency differ so widely.

PRESERVATION OF BARNYARD MANURE.

In the annual report of the farms for 1894 (page 42) the director gives the details of an experiment carried on for nine months to ascertain the loss of weight that resulted on keeping manure in a partially closed shed. This sample consisted of equal parts of cow and horse manure, and weighed four tons (8,000 pounds) when the experiment began in March. It was reduced to 3,480 pounds by July. In February, one year after the commencement of the trial, the weight was 2,659 pounds.

Though no analysis was made of the fresh manure, we may, I think, safely assume the sample, when put in the shed, to have had the following proximate composition, since these figures were obtained as averages from several analyses of similar manures made on the Central Farm :—

AVERAGE COMPOSITION OF FRESH (MIXED) MANURE.

—	Per cent.	Pounds per ton.
Nitrogen	·52	10·4
Phosphoric acid	·32	6·2
Potash	·76	15·2

A sample taken in February, 1895, that is, after the manure had been in the shed one year, was submitted to analysis, with the following result :—

ANALYSIS OF ROTTED MANURE, ONE YEAR OLD.

—	Per Cent.	Pounds per Ton.
Nitrogen	·888	17·76
Phosphoric acid	·733	14·66
Potash	1·496	29·92

Comparing these data with those of the preceding table, it will be seen that the rotted manure, weight for weight, is much richer in the essential elements of plant food than the fresh manure. To ascertain what losses, if any, had occurred during the year's rotting, the total weights of these constituents at the beginning and end of the experiment have been calculated, as follows :—

—	Nitrogen.	Phosphoric Acid.	Potash.
	Lbs.	Lbs.	Lbs.
8,000 pounds of fresh manure	41·6	24·8	60·8
2,659 pounds of rotted manure	23·6	19·5	39·8

These results show that under the conditions of experiments considerable loss of fertilizing ingredients had resulted. The experiment is being repeated this year under somewhat different conditions. Two lots equal in weight and alike in composition, one in an open bin, the other in a closed shed, are being weighed and analysed month by month. The total percentages of the phosphoric acid and potash as well as the amounts immediately available for plant use are being determined. It is expected that when the investigation is completed, we shall be in possession of some interesting and instructive information on this important question.

THE FERMENTING OF MANURE WITH FINELY GROUND MINERAL PHOSPHATE.

It has been repeatedly urged in certain quarters that the phosphoric acid of finely ground mineral phosphate may be rendered soluble and available by fermenting with barnyard manure. To ascertain to what extent this assertion might be true, the experiment now to be described was made.

On April 29 finely ground mineral phosphate was mixed with strongly fermenting manure (composed of equal parts of horse and cow manure) at the rate of 50 pounds of the phosphate per ton of manure. The sample, weighing 11 pounds, was put in a glass jar and covered with two thicknesses of stout canvas. The jar was then placed in the middle of an actively fermenting manure heap and allowed to remain there until August 20, when the contents were quite dry and crumbly. The weight of the sample at this date was three pounds one ounce, showing not only a loss of moisture, but that decomposition involving the destruction of organic matter similar to that which always takes place in rotting manure, had taken place. A portion of this sample was then treated for five hours with a 1·0 per cent solution of citric acid, and the phosphoric acid determined in the filtrate. The solution here mentioned is that largely used in estimating the percentages of available plant food in the soil, since Dr. Dyer, by careful research, has shown it to have a solvent effect approximately equal to that of root sap and the exudations of rootlets. Phosphoric acid to the extent of ·237 per cent was found, when calculated to the original manure.

A sample of the same manure, fermented under the same conditions, but without the addition of mineral phosphate and for the same period, gave, when calculated to the original weight of manure, ·241 per cent phosphoric acid.

These figures may be considered identical, since the difference is such as may be easily accounted for by the usual errors of experiment; consequently there would appear to be no solvent action, or at most a very slight one, on the mineral phosphate exerted by the manure during the process of fermentation.

CLOVERS AS GREEN MANURES.

The practice of green manuring or the turning under of growing crops is coming more into favour, as its merits become better known. Experience has shown it to be often the best and most economical method of improving a soil, both chemically and mechanically. It furnishes humus and nitrogen, both necessary to fertility, and does an excellent work in preparing soil food for future crops.

The humus thus supplied increases the retentive power of light soils for moisture ameliorates the condition of heavy clays and regulates the soil temperature. By the carbonic acid liberated in its decay, the inert plant food of the soil is dissolved. Briefly stated, these are the chief physical advantages of green manuring.

The elements that compose humus, with the exception of its nitrogen, are derived entirely from the atmosphere, so that in the benefits conferred by the presence of humus and its decomposition there is a distinct gain.

Further, we may well suppose that the mineral matter or ash constituents of the green crop are, by the decay of the latter in the soil, set free in a condition more or less

immediately available to plants. Hence, although, such a method of manuring has not added to the total store of mineral food in the soil, it has materially enhanced its value by conversion into more assimilable forms. But it is in supplying nitrogen that green manuring has its principal value. When employing rye, buckwheat or other plants not legumes, the nitrogen stored within the tissues of the crop has been obtained from the soil, but with the legumes (clover, pease, &c.) the case is different. They, under favourable conditions, have the power of appropriating the larger part of their nitrogen from the atmosphere; on account of this property they have, therefore, been termed "nitrogen collectors." Since nitrogen is the most expensive of all the elements when fertilizers have to be purchased, the value of green manuring with the legumes, which are exceedingly rich in this constituent, becomes apparent.

The whole question of green manuring is discussed somewhat fully in my report for last year (page 210-213); it will not, therefore, be necessary to again emphasize in all its bearings the advantages of this practice. It will, however, be of considerable interest to supplement the analytical data given last year regarding the value of the clover crop, by those obtained during the past season.

In an experiment carried on this year, Mr. Craig, the Horticulturist, has ascertained the relative merits of certain clovers as "cover" crops for orchards. The data and conclusions from this aspect are to be found in Mr. Craig's report, page 151. We now append the chemical data, comprising the composition of these clovers in the fresh condition, together with the amounts of organic matter, mineral matter and nitrogen, as ascertained to be present in the leaves and stems and the roots, to a depth of two feet, per acre.

ANALYSES OF CLOVERS, 1896.

Clover.	Composition.			Nitrogen.	Weight of Crop Per Acre.		Amount of certain Constituents Per Acre.		
	Water	Organic Matter.	Ash.				Organic Matter.	Ash.	Nitrogen.
(Sown July 13th, 1896, Cut October 20th, 1896).					Tons.	Lbs.	Lbs.	Lbs.	Lbs.
Crimson Clover, stems and leaves..	83·32	13·91	2·77	0·382	11	234	2,093	602	85
" roots.	83·87	12·92	3·21	0·304	3	201	801	199	19
Total................	...	....	....	....	14	435	2,894	801	104
Alfalfa, stems and leaves........	71·63	23·81	4·56	0·671	5	1,192	2,664	510	75
" roots....................	64·74	29·47	5·79	0·557	5	558	3,120	613	61
Total................	......	....	.....	....	10	1,750	5,784	1,123	136
Mammoth Red, stems and leaves..	79·13	17·05	3·82	0·620	6	1,310	2,269	508	82
" roots.	77·57	19·41	3·02	0·662	3	1,260	1,409	219	48
Total......	.. ..	....	.....	....	10	570	3,678	727	130
Common Red, stems and leaves....	76·24	18·84	4·92	0·718	4	1,779	1,842	481	70
" roots..............	71·22	25·61	3·17	0·784	2	1,445	1,394	172	47
Total..........	......	....	.. ..	....	7	1,224	3,236	653	117

The following measurements were recorded when the photographs, from which the accompanying engravings were made, were taken:—

Crimson Clover, tops	11 inches.
" roots	6 "
Alfalfa, tops	18 "
" roots	32 "
Mammoth Red Clover, tops	7 "
" " roots	6 "
Common Red Clover, tops	9 "
" " roots	7 "

The weights of seed sown were:—

Crimson Clover	20 lbs. per acre.
Alfalfa	15 "
Mammoth Red Clover	15 "
Common Red Clover	12 "

The weight of crop was calculated from the yield of one square yard—the roots being taken to a depth of two feet.

CRIMSON CLOVER.

Crimson Clover.—In total weight of green stuff per acre the Crimson Clover gives the highest figures, but, on account of the very large percentage of water, it is seen to furnish less organic matter or humus than any of the other crops experimented with.

As in humus, so in nitrogen, yielding but 104 pounds per acre, while the other crops give considerably higher results. In this connection it is worthy of note that the Crimson Clover roots are very poor in nitrogen, and therefore when this crop is intended as a nitrogenous enricher the whole plant should be turned under.

The amount of mineral matter assimilated stands second in the tabulated results. When turned under, this clover, therefore, furnishes a large amount of ready prepared mineral food for succeeding crops.

COMMON RED CLOVER.

Common Red Clover.—Though giving the least weight of crop, this clover ranks higher than Crimson Clover in its nitrogen and humus content per acre. In ash constituents or mineral matter it possesses about two-thirds the amount in Crimson Clover. Its root system is not so heavy as that of the other clovers of the experiment, but the quantity of plant food contained in it is not far behind that in the Mammoth Red Clover roots.

ALFALFA.

Alfalfa.—In total yield of crop, Alfalfa stands second. It was from this plant we obtained the largest amount of humus in the stems and leaves, as well as in the roots. It also afforded the most nitrogen per acre, nearly half of which is in the roots—a feature in which it stands alone among the clovers experimented with and one of great importance when the crop is intended for soiling or curing. The extensive or rather deep root system is of much value in the mechanical improvement of the soil; it serves to bring to the surface layers much plant food ordinarily out of the reach of farm crops.

MAMMOTH RED CLOVER.

The mineral matter exceeds by 300 pounds per acre the amount in the Crimson Clover crop—the next best in this respect. More than half of the 1,100 pounds of ash constituents recorded as stored in the yield per acre, is contained in the roots.

Taking into consideration all the important requirements, from a chemical standpoint, of a crop for green manuring, the Alfalfa gave the best results in the present investigation.

Mammoth Red Clover.—In yield per acre, of organic matter and nitrogen this crop stands a close second to Alfalfa. The amount of nitrogen in the foliage is slightly greater than that in the foliage of Alfalfa, but the roots of the Mammoth Clover contain per acre only two-thirds of the amount in the Alfalfa roots in the same area. Although the ash constituents in the foliage of these two crops are almost identical in amount, the roots of the Mammoth Clover possess but one-third, approximately, of that in the Alfalfa roots.

The following table gives the percentages of nitrogen in the organic matter of the foliage and of the roots. The results have been calculated from the amounts of organic matter and nitrogen recorded in the foregoing table :—

PERCENTAGE OF NITROGEN IN THE ORGANIC MATTER OF CLOVERS.

Crimson Clover, stems and leaves	2·74
" roots	2·35
Alfalfa, stems and leaves	2·82
" roots	1·92
Mammoth Red Clover, stems and leaves	3·63
" roots	3·41
Common Red Clover, stems and leaves	3·81
" roots	3·06

From the figures it is obvious that the organic matter (which with the ash constituents comprise the total "dry matter" of the plant) varies in its richness of nitrogen according to its position in the plant, and that there is a greater percentage of nitrogen in the organic matter of the foliage than in that of the roots. Since the nitrogen is assimilated and elaborated in the roots, this fact points to a more or less rapid migration of the nitrogen compounds from the roots to the foliage. There does not appear to be any relation between the amount of organic matter and the percentage of nitrogen that such organic matter contains; it is more than probable that the differences here recorded are due to the stage of growth or relative maturity of the crops under investigation—a deduction that receives corroboration from our chemical work upon the corn plant.

THE ASSIMILATION OF NITROGEN BY LEGUMES.

So many letters have been received during the past year respecting this question, that it may prove of more than passing interest if I here insert brief replies to some of the more frequently occurring and important inquiries.

1. Do the legumes absorb nitrogen by the leaves?—A. There is no nitrogen assimilated by the leaves of the legumes. All absorption of free nitrogen is by means of the bacteria in the nodules on the roots.

2. Do the legumes use nitrogen other than that in the air?—A. Legumes, like all other plants, can make use of soil nitrogen (not free nitrogen), and this they specially do when young. Unless the soil is somewhat poor in nitrogen—when it is said to be "nitrogen hungry"—there appears to be but little assimilation of free nitrogen and but a poor development of nodules.

3. How can it be said that the free nitrogen of the atmosphere is utilized by the legumes when it is stated that assimilation is by the roots?—A. The free nitrogen made use of by the micro-organisms in the nodules is in the air occupying the interstices of the soil. In all soils, but especially in well drained and light soils, there is a large quantity of air.

4. How do the organisms in the nodules make use of the nitrogen, and what becomes of the nitrogenous compounds formed in the roots?—A. It is not known how the legumes utilize free nitrogen and convert it into organic compounds. It is, however, evidently a life function.

The nitrogen compounds elaborated in the nodules migrate (most probably as amides, soluble compounds afterwards converted into albuminoids) into the stems and leaves. This, as a rule, leaves the roots poorer in nitrogen than the foliage. The ratio of the nitrogen in the roots to that in the foliage is a fluctuating one, depending chiefly on the stage of growth or maturity of the plant.

5. When is the best time to turn under a crop of clover or other of the legumes?—A. After the time the seed has begun to form there will not be much more assimilation of free nitrogen. If, therefore, it is wished to enrich the soil, in addition to the nitrogen, with a large quantity of humus capable of ready decomposition in the soil, the ploughing should be done soon after the flowering of the plant, and before the fibre becomes hard and the nitrogen for the most part gone into the seed.

If sown after cereals as a "catch" crop, it will usually be the best practice to plough it under in the autumn, at the end of the growing season. If sown as a "cover" crop, as in orchards, it should be left till the following spring.

6. What loss of nitrogen would ensue on allowing the clover to freeze down and remain uncovered all winter?—A. There would in all probability be some loss, but unless the winter were an open one, it would be very slight.

7. Is green manuring with the legumes as profitable as purchasing commercial fertilizers?—A. Under ordinary circumstances it is the cheapest and most economical means of supplying nitrogen and humus—both essential constituents to soil fertility. Green manuring not only enriches the soil composition in these elements, but adds largely to the store of available mineral food and greatly improves the tilth of heavy clays, light and sandy soils and all soils deficient in humus.

FERTILIZING CONSTITUENTS IN PRICKLY COMFREY

(*Symphytum asperrimum*).

This forage plant is a rank growing, succulent, but somewhat harsh perennial. It is not in general favour as a fodder, as it is harvested with considerable difficulty, and cattle must become accustomed to it before eating it readily. It appears to have given better satisfaction as a soiling crop than when preserved as hay or in the silo. At the Wisconsin Station, U.S.A., the second year's growth of prickly comfrey was cut four times, yielding at the rate of nearly 34 tons per acre. They, however, concluded that this plant cannot compare in value as a cattle food with red clover.

It being generally believed that prickly comfrey quickly exhausts the soil, an analysis of the plant, as grown in the experimental plots under the care of Dr. Fletcher (who furnishes me with the above note), has been made during the past year. The data obtained show the proximate composition and the chief fertilizing elements withdrawn from the soil :—

Analysis of Prickly Comfrey.

(Cut while in flower, 26th July; 2nd crop, C. E. F.)

Water	87·05
Organic matter	10·09
Ash or mineral matter	2·86
	100·00

Fertilizing Constituents.	Per cent.	Pounds per ton.
Nitrogen	·413	8·26
Phosphoric acid	·164	3·28
Potash	·186	3·72

Presuming that 20 tons of the green material could be obtained per acre, the following figures would represent the essential fertilizing ingredients taken from that area of the soil :—

Nitrogen	165 pounds.
Phosphoric acid	65 "
Potash	74 "

It is thus seen that this crop makes a considerable draught upon the soil store of plant food. In feeding such crops, care should be taken of the resulting manure, which contains from 60 per cent to 80 per cent of the fertilizing constituents taken from the soil. No permanent harm is done by the cultivation of the so-called exhausting crops, provided that this care is exercised, and that the manure is returned to the soil.

WOOD ASHES.

The following data were obtained on two samples forwarded by Mr. J. H. Wismer, of Port Elgin, Ont. They purported to be pure ashes from the incineration of maple and basswood, respectively, but were found to contain a considerable amount of charcoal together with a small percentage of sand and other inert matter; consequently the percentages of phosphoric acid and potash here given must not be considered as representing the quantities of these elements in the pure ash, but as indicating those present in good commercial samples prepared from these woods.

Analysis of Wood Ashes.

	Phosphoric Acid.		Potash.	
—	Total.	Soluble in one per cent Citric Acid.	Total.	Soluble in one per cent Citric Acid.
Maple ashes	1·60	0·69	6·54	4·35
Basswood ashes	2·85	0·63	3·68	2·12

We are aware that the various woods differ considerably in the amounts of ash or mineral matter and in their respective potash and phosphoric acid content, but exact data from Canadian sources have not as yet been obtained. There is a common impression that soft wood ashes are poorer in potash than those from the hard woods, and this opinion receives some corroboration from the above results. It should be remembered, however, that soft wood ashes are lighter, bulk for bulk, than hardwood ashes and, therefore, a bushel measure of the former would necessarily contain less potash than the same quantity of the latter. As time permits, it is proposed to continue this investigation with carefully prepared ashes from various Canadian grown woods, so that we may be able to give reliable information on this subject. Though, perhaps, not generally known, the ashes from twigs and young boughs are richer in potash than those from the older wood. This fact may in some measure account for the varying amounts of this element as found in different commercial samples, some being from brush, while other being from trunks and large boughs.

Potash is a constituent required in comparatively large amount by all leafy crops. Good wood ashes are therefore an excellent, and in many parts of Canada, a very cheap source of potash. Farmers and orchardists will do well to use them more generally—more especially on light sandy soils, than they have been in the habit of doing in the past. If a good rotation of crops is followed, green manuring with the legumes occasionally resorted to and the barnyard manure carefully looked after, wood ashes will supply all additional plant food necessary to keep up the fertility of the soil.

It is sometimes stated by those interested in the sale of German potash salts that all the potash in wood ashes is not immediately available for plant use. To ascertain what truth there might be in that assertion, the percentage of potash and phosphoric acid soluble is one per cent citric acid solution were determined—this solution having, according to Dr. Dyer, a solvent action approximately equivalent to that of root sap. The results obtained by this means show that 43 per cent of the phosphoric acid and 66 per cent of potash in the maple ashes were brought into solution, and that the basswood ashes by this method yielded 22 per cent of their phosphoric acid and 60 per cent of the potash. It would seem highly probable that the proportion of potash and phosphoric acid soluble in the reagent above referred to would depend on the degree of heat attained in the production of the ashes, and that the higher the temperature the smaller the percentage of the constituents available, as measured by this method. We hope to make a series of experiments to ascertain how far this conjecture may be correct.

GARBAGE ASHES FROM CITY REFUSE.

It has now become the practice in large cities to dispose of the garbage by incineration in crematories From a hygienic standpoint this is undoubtedly an admirable method, as heaps of decomposing vegetable refuse and similar material in the neighbourhood of thickly populated districts must to a greater or less degree bring about an unsanitary condition. The disposal of the residual ashes raises the question as to their agricultural value, and in order to ascertain this, analyses have been made of samples procured from Toronto and Vancouver, where crematories are in operation. The nitrogen in the refuse is dissipated in the burning, and, therefore, the phosphoric acid and

potash must be considered as the chief elements of fertility that give the ashes a value to the farmer. In addition to these however, lime, magnesia, and other mineral constituents, of service to crops, are present in fair quantities.

The phosphoric acid in these ashes is not so valuable as that in superphosphate, for it is but slightly soluble in water; we should presume it is about equal to that in bone ash, as regards availability. Nor, do we suppose, that the potash is quite so available as that in wood ashes or the German potash salts. Nevertheless, it will be evident from the subjoined analysis that these ashes have a distinct value in supplying these mineral elements of plant food.

In the following table are the results of our analysis of a sample sent by a correspondent, and said to have been obtained from the Toronto crematory:—

ANALYSIS OF GARBAGE ASHES.

—	Per cent.	Pounds per ton
Moisture	2·02	45·0
Phosphoric acid	2·20	44·0
Potash	2·82	56·4

In wood ashes, the phosphoric acid varies in extreme samples from ·5 per cent to 2·5 per cent with an average of 1·9 per cent. The potash in wood ashes may vary between 2·5 per cent in very poor samples to 8·5 per cent in very rich; the usual amount in fair samples is from 4·5 per cent to 6·0 per cent. Comparing these data with the above analysis, it is evident that garbage ashes are much inferior to good wood ashes.

Two samples of garbage ashes from Vancouver, B.C., and stated to be from the crematory at that city, afforded the following results:—

ANALYSIS OF GARBAGE ASHES.

—	"A" Received August 10th, 1896.	"B" Received November 14th, 1896.
Moisture	4·70	1·17
Organic and volatile matter (loss on ignition)	11·08	11·33
Insoluble matter	30·82	27·05
Phosphoric acid	11·66	13·05
Potash	1·74	2·15

"A" contains, per ton, 233 pounds of phosphoric acid and 35 pounds of potash.

"B" contains, per ton, 261 pounds of phosphoric acid and 43 pounds of potash.

In sample "B" many large fragments of burnt bone are to be seen.

From the variable character of this material, made evident by the nature of its production, as well as by the foregoing figures, it is evident that garbage ashes should only be purchased on analysis, the results stating the percentages of potash and phosphoric acid and the condition in which the latter exists, as regards solubility. Sand, clay, coal ashes and other inert matter may be present in considerable quantities, and thus lessen the value of the product; or from insufficient ignition there may be a large amount of charcoal, which would also, to some extent, reduce the fertilizing worth of the ashes.

THE FERTILIZING VALUE OF WHEAT BRAN ASH.

From a communication received from Mr. C. C. Macdonald, Dairy Commissioner for Manitoba, it would appear that "Wheat bran is used as a fuel in the flour mills of the province of Manitoba when its price is as low as $4.00 per ton. It is then estimated to be a cheaper fuel than wood." It occurred to Mr. Macdonald that the resulting ashes might be valuable as a fertilizer, and accordingly he sent a sample for analysis and report.

The sample was white and semi-opaque, the edges of the lumps being fused, giving it a slag like appearance.

Analysis of Bran Ash.

———	Per cent.	Pounds per ton
Moisture	·87	....
Phosphoric acid	45·01	900
Potash	24·55	491

It will be seen that this material is remarkably rich in potash and phosphoric acid, the greater part of which is soluble in water, and hence immediately available for plant use. Assigning to these elements the following values:—Phosphoric acid, 6 cents per pound; potash, 5 cents per pound (quite reasonable values), we obtain a value of $78.55 per ton of ashes.

The question as to whether bran, under certain conditions of price, can be used economically as compared with wood, is one that is outside my province here to discuss, but it should be pointed out that the burning of bran seems an extremely wasteful practice, since thereby all the nitrogen, its most important constituent, is lost. The percentage of ash in bran is approximately 6·8, 15 tons of bran must, therefore, be burnt to produce one ton of ash. Now, since bran contains 2·36 per cent of nitrogen, the amount of this valuable fertilizing element lost in the burning of 15 tons would be 708 pounds, which at 14 cents per pound would amount to $99.10. In other words, for every $78 worth of potash and phosphoric acid obtained $100 worth of nitrogen is lost. Considering bran from the standpoint of a fertilizer, it would be far more profitable to compost it than to burn it, that is, of course, provided there were not sufficient farm stock to feed it to.

BROKEN OYSTER SHELL.

This material was forwarded by Major Theakston, of Halifax, N.S., with a request for a report on its agricultural value. As received, it was in a fairly fine condition, though only a small portion of it was in the form of powder. It appeared to be practically free from foreign matter (sand and clay), consisting, one might say, entirely of the broken shells.

Analysis.

Moisture	·33
Organic and volatile matter	8·52
Insoluble mineral matter	3·13
Mineral matter soluble in acid	88·02
	100·00
Lime (present as carbonate)	50·01
Phosphoric acid	·08
Nitrogen	·18

From the above data it is evident that the composition of the shells is essentially carbonate of lime. The amounts of nitrogen and phosphoric acid are too small to make their consideration necessary, the fertilizing value depending solely on the carbonate of lime present.

Respecting the functions of lime in the soil, it will not perhaps be necessary to repeat what has already appeared in previous reports (see page 161–2, Report of the Experimental Farms, 1894), but it may be well to add that I am of the opinion that unless the shells were finely powdered—the produce being in the form of flour—that the lime would be but slowly soluble in the soil, and hence but slowly available for plant use.

Looking to the immediate usefulness of lime in the soil, burning the shells would be a more economical method of treating them than a reduction to small fragments—though the process would necessarily lead to the loss of the small quantity of nitrogen they contain. Burning would convert the carbonate of lime into caustic or quick lime, a reduction in weight of about 50 per cent resulting, due to the escape of carbonic acid. Since carbonic acid has in such a combination no agricultural value, this plan would effect a considerable saving in freight. Quick lime is more active than the carbonate, giving more immediate and more marked results in soils deficient in lime. Burning could scarcely be more expensive than finely powdering, and therefore, in view of the above, it suggests itself as the way in which to prepare the shells.

For the use of poultry, broken oyster shells have a well marked value. Experienced poultrymen know that not only are they excellent in furnishing material for egg shell formation, but that they also assist in the digestion of the food by supplying the necessary grit for the trituration or reduction of the grain in the fowl's gizzard.

FISH MEAL

The subjoined analysis of fish waste or meal was made on a sample forwarded by a correspondent in St. George, N. B., who described his method of manufacture as follows: "A quantity of herrings was salted and allowed to stand four days. They were then boiled and pressed to separate the oil. The residue was dried in the sun, broken up and passed through an ordinary coal seive.

Analysis of Fish Meal or Fish Guano.

Moisture	26·91
Organic and volatile matter	57·04
Mineral matter	16·05
	100·00
Total phosphoric acid	4·78
Phosphoric acid, soluble in 1 per cent citric acid	4·04
Nitrogen	10·32

Fish guano (as it is sometimes called) varies much in its composition—the amounts of fertilizing ingredients present depending on its mode of manufacture and condition as regards moisture and decomposition.

Thus, analyses made in the farm laboratories in 1892-93, afforded the following data:—

ANALYSIS OF FISH GUANO.

——	From Kentville, N. S.	From Ladner's Landing, B. C.
Moisture	29·40	5·19
Organic and volatile matter	20·28	46·99
Mineral matter	50·32	47·32
	100·00	100·00
Phosphoric acid	4·70	17 60
Nitrogen	2·39	3·47

A consideration of these figures makes it clear that in fish meal we have, as a rule, a fertilizer rich in phosphoric acid and nitrogen. Moreover, these elements are in a more or less readily available condition for plant growth. This is made evident by the large proportion of the phosphoric acid soluble in a solution of one per cent citric acid—a solution equivalent, as shown by Dr. Dyer, in solvent action to the exudation of plant rootlets. It is on account of the ready availability of its constituents, that fish guano is recognized as a quick-acting, forcing manure ; for the value of a fertilizer, it must be remembered, depends not only on the total amounts, but also upon the condition, of its elements. Fish waste is a manure that ferments easily in the soil, and the decomposition that there ensues, sets free its plant food.

Its rational and economical use requires a supplemental application of wood ashes, kainit or muriate of potash—since in potash this fertilizer is almost wanting.

Being a concentrated and quick manure it is often used as a top dressing, but better results are generally obtained by lightly harrowing it in. It has been of special value for grain crops and grass, and, as a rule, gives better returns on light, warm soils than on those that are heavy and cold.

Fish waste may be advantageously employed as a composting material with muck, peat, &c. The resulting fermentation converts much of the plant food of the latter into assimilable forms, and a large amount of a rich, strong manure is obtained. We have received the testimony of many practical farmers, both on the Atlantic and Pacific coasts (where this fertilizer could most easily be manufactured) to the effect that excellent results have attended its use when applied according to the principles and directions here set forth.

COMMERCIAL FERTILIZERS.

The number of inquiries sent to this division during the past year regarding the nature of commercial or chemical fertilizers—the use of which is becoming more extended in Canada—makes it desirable to present to our readers the following table which shows the composition of most of the materials that can be purchased by farmers, and which are largely used by manufacturers in making their various brands of fertilizers. Respecting the latter, it is only necessary to point out that all mixed fertilizers manufactured or sold in Canada are annually analysed, under the Fertilizer Act, by the Inland Revenue Department, and that the results of this examination, published in bulletin form, are to be obtained on application.

It is not the intention at the present time to discuss the various merits of different artificial fertilizers, nor the principles involved in their economic use, but it may be stated that whether the original substance or the ready-mixed fertilizer is bought, an

analysis should be demanded, for the value of a sample is directly dependent upon the percentages and availability of the nitrogen, potash and phosphoric acid it contains.

Chemically pure nitrate of soda and sulphate of ammonia are not sold for agricultural purposes, but their nitrogen contents have been given for the purpose of showing the difference between them and the commercial article, stated in the second line.

COMMERCIAL FERTILIZERS

Fertilizer.	Nitrogen.		Phosphoric Acid.		Potash.	
	Per cent.	Lbs. per ton.	Per cent.	Lbs. per ton.	Per cent.	Lbs. per ton.
Nitrate of soda	16·47	329·4				
" 95 per cent	15·65	313·0				
Sulphate of ammonia	21·21	424·2				
" 95 per cent	20·15	403·0				
Dried blood	10·5	210·0	1·91	38·2		
Dried fish waste	7·2	144·0	8·2	164·0		
Peruvian guano	7·85	157·0	15·26	305·2	2·65	53·0
Mono Island guano	·76	15·2	21·88	437·6		
Cotton seed meal	6·47	129·4	2·33	46·6	1·72	34·4
Bone meal	4·01	80·2	23·3	466·0		
Apatite, 85 per cent (phosphoric acid insoluble)			38·9	778·0		
" 50 per cent " "			22.9	458·0		
Superphosphate of lime (phosphoric acid soluble)			12 to 25	240 to 500		
Basic slag			17 to 23	340 to 460		
Wood ashes leached			1·5	30·0	1·2	24·0
" unleached			2·0	40·0	5·5	110·0
Muriate of potash					63·1	1262·0
" 83 per cent					52·3	1046·0
Sulphate of potash					54·0	1080·0
" 92 per cent					49·7	994·0
Kainit (average)					13·5	270.0
Farm-yard manure, mixed	·5	10·0	·3	6·0	·6	12·0

Most worn and partially exhausted soils respond best to a complete fertilizer, namely, one that contains all three of the essential elements of plant food—nitrogen, potash and phosphoric acid. The peculiar deficiencies of certain soils and the special requirements of certain crops, however, make it often advantageous that some one or two of these elements should predominate. Such information can only decisively be arrived at by carefully experimenting with the soil and crops under consideration, and it is always wise to make trials on small areas before making a large outlay, or an extensive application.

It will be observed that certain fertilizers contain nitrogen only, others phosphoric acid, and yet others potash. Again, there are those possessing two of these elements, while others possess all three. The tabulated information now furnished will prove useful to the intelligent farmer who wishes to supplement barnyard manure (see last line of table) with a special fertilizer rich in one or other of the above named elements.

The home mixing of fertilizers may be conducted upon the farm, and, compared with the purchasing price of commercial brands upon the market, a saving, approximately, of 25 per cent usually effected. This work, however, can only be done to advantage by those possessing some knowledge of the nature of the materials employed and should not be undertaken by the farmer without first ascertaining whether the mixture he prosposes to make will deteriorate on keeping. Thus, as an instance, serious loss of nitrogen would result on mixing sulphate of ammonia and wood ashes.

Those desirous of obtaining further information on the subject of fertilizers and their application are invited to correspond with this division.

THE CHEMISTRY OF THE CORN PLANT.

In the report of the Experimental Farms for 1891 and in Bulletin No. 12 of the farm series, data obtained in the Experimental Farm laboratories are to be found respecting the value of Indian corn as a fodder crop. The results there given were, however, incomplete; those now to be stated have been obtained since the publication of the last report and furnish much useful information respecting the composition of this important fodder plant at various stages of growth.

The varieties included in this investigation were Longfellow, Pearce's Prolific, Thoroughbred White Flint and Red Cob Ensilage. Samples of these were taken at the periods of growth mentioned below, from plots on high and low ground, the weight of the crop on one-twentieth of an acre in each case being ascertained and the results averaged. The portion taken for analysis was from a sample prepared by cutting up an equal number of corn plants from each plot. The weighings were made and samples for analysis taken when the corn was (*a*) tasselling, (*b*) silking, (*c*) early milk, (*d*) late milk, and (*e*) glazing. From these data the value of the crop at these periods, per ton and per acre, has been determined.

THE CHEMISTRY OF THE CORN PLANT—Table I.

Composition of Green Material and Water-Free Substance.

No.	Variety.	State of Growth.	In Fresh or Green Material.						Calculated to Water-Free Substance.				
			Water.	Ash.	Protein (Albuminoids).	Fibre.	Nitrogen-free extract (Carbohydrates).	Ether extract (Fat).	Ash.	Protein (Albuminoids).	Fibre.	Nitrogen-free extract (Carbohydrates).	Ether extract (Fat).
1	Longfellow.	Tasselling .	86·87	1·36	1·61	4·47	4·21	1·48	10·35	12·27	34·05	32·07	11·26
2	"	Silking	86·02	1·13	1·48	4·27	6·18	0·92	8·05	10·61	30·53	44·25	6·56
3	"	Early milk..	82·84	0·96	1·74	5·13	7·89	1·44	5·62	10·13	29·92	45·93	8·40
4	"	Late milk...	77·51	1·14	1·90	5·57	12·33	1·55	5·06	8·45	24·76	54·82	6·91
5	"	Glazing... .	75·28	1·05	1·78	5 51	14·58	1·80	4·23	7·2	22·31	58·97	7·29
6	Pearce's Prolific......	Tasselling ..	84·52	1·35	1·97	3·73	7·45	1·08	8·70	12.73	24·12	47·43	7·02
7	"	Silking.....	84·91	1·35	1·42	4·93	6·22	1·17	8·99	9·39	32·66	41·21	7·75
8	"	Early milk..	81·90	1·11	1·37	5·31	8·69	1·62	6·14	7·57	29·37	47·96	8·96
9	"	Late milk...	79·00	1·02	1·45	5·03	11·78	1·72	4·85	6·90	23·97	56·07	8·21
10	"	Glazing.....	72·36	1·14	1·65	6·74	16·03	2·08	4·77	5·97	24·41	57·33	7·52
11	Thoroughbred White Flint	Tasselling ..	85·84	1·09	1·38	4·66	6·04	0·99	7·72	9·78	32·90	42·58	7·02
12	" " ..	Silking.....	85·27	1·21	1·54	4·95	6·11	0·92	8·24	10 49	33·59	41·45	6·23
13	" " ..	Early milk..	81·42	1·02	1·47	5·28	9·2	1·61	5·47	7·91	28·41	49·55	8·66
14	" " ..	Late milk ..	77·07	0·99	1·31	6·16	12·4	2 07	4·31	5·74	26·89	54·01	9·05
15	Red Cob Ensilage. ..	Tasselling ..	85 68	1·20	1·20	4·89	5·89	1·14	8·42	8·41	34·18	40·98	8·01
16	"	Silking.....	79·14	1·27	1·18	7·20	10·08	1·13	6·12	5·66	34·54	45·77	7·91
17	"	Early milk..	76 06	1·22	1·13	7·10	12·47	2·02	5·12	4·71	29·67	52·04	8·46

NOTE. The Thoroughbred White Flint and Red Cob Ensilage did not come to the glazing condition before the season closed.

First. We may first draw attention to the diminution of water and the consequent increase of "dry matter" as growth proceeds. This increase of food constituents is a steady one between the periods named, and may be easily ascertained by subtracting the percentage of water from 100.

Second. It will be noticed that the percentage of ash (or mineral matter taken from the soil) in the corn plant diminishes as the plant matures. This becomes the more noticeable on calculating the percentage of ash on the water-free substance.

Third. There is in some instances a slight increase in the percentage of albuminoids or protein as the corn approaches the glazing condition. The increase, as the season advances, of the other food constituents, is, however, so much greater, that when calculated to the water-free substance the percentage of the albuminoids becomes considerably less in the mature corn than in the dry matter of the earlier growth.

Fourth. The percentage of fibre increases slightly in the fresh material as the season advances, but for the reason just stated it decreases when calculated to the water-free material.

Fifth. The "ether extract," consisting principally of fat or oil, increases somewhat with the growth of the plant.

Sixth. The nitrogen-free extract, sometimes termed carbo-hydrates, and consisting of starch, sugar, gum and allied substances, increases rapidly with the maturity of the crop.

These facts will be the more apparent on studying the next table, which gives the averages of all the varieties at the stages named.

THE CHEMISTRY OF THE CORN PLANT—Table II.

Average Composition at Different Stages of Growth.

Average of the following varieties :— Longfellow. Pearce's Prolific. Thoroughbred White Flint. Red Cob Ensilage.	In Fresh or Green Material.						Calculated to Water-free Substance.					Percentage of Dry Matter in Green Material.
Stage of Growth.	Water.	Ash.	Protein (Albuminoids).	Fibre.	Nitrogen—free extract (Carbo-hydrates)	Ether extract (Fat).	Ash.	Protein (Albuminoids).	Fibre.	Nitrogen—free extract (Carbo-hydrates)	Ether extract (Fat).	
Tasselling..........	85·73	1·25	1·51	4·44	5·90	1·17	8·80	10 80	31·31	40 76	8 33	14·27
Silking........	83·84	1·24	1·40	5·34	7·15	1·03	7·85	9·04	32·83	43·17	7·11	16·17
Early milk.......	80·55	1·08	1·43	5·71	9·56	1·67	5·59	7·58	29·34	48·87	8·62	19·95
Late milk........	77·86	1·05	1·55	5·59	12·17	1·78	4·74	7·03	25·21	54·97	8·05	22·14
Glazing........................	73 82	1·08	1·71	6·12	15·33	1·94	4·70	6·58	23·36	58·16	7·40	26·18

CONCLUSIONS.

First. That cutting the corn before it reaches the glazing condition—a practice quite common a few years ago—is not to be advised, since in the latter stages of the plant's growth there is a large gain in food constituents. All our data, both in the field and laboratory, go to show the wisdom of allowing the corn to come to the glazing condition before harvesting, either for the silo or for drying in stooks.

Second. The mineral constituents (ash) are taken by the plant from the soil, more particularly during its early stages of growth. This points to the advisability of having the soil well manured and prepared previous to planting. By such means the young plant will have immediate access to a large amount of readily available plant food. Thorough cultivation, thereby preserving soil moisture and preventing weed growth, will also tend to have a beneficial effect in this direction. In many parts of Canada wood ashes afford cheap sources of potash and phosphoric acid for the needs of this and other farm crops. In localities where wood ashes are not easily or cheaply obtained, kainit and superphosphate may be used to supply the chief mineral ingredients.

Third. The albuminoids, often termed the flesh-formers, are determined in the laboratory by estimating the nitrogen (their essential element) and multiplying the amount found by 6·25. In the young plant much of the nitrogen, we know, exists in forms of less feeding value than the albuminoids, and we have every reason to believe that as the plant ripens these compounds are transformed into albuminoids. The decrease in albuminoids is, therefore, only apparent and not real, and this consideration lends additional strength to the advice given respecting the best time to cut the corn.

Like the ash constituents, the nitrogen (also taken from the soil) is drawn upon chiefly by the young plant, and the argument already used respecting manuring, tillage and cultivation might well be repeated here.

Fourth. The large percentage of the gain already referred to is due to the storing up of carbo-hydrates. These, by their digestion and assimilation, furnish to the animal heat and energy, most valuable and important functions. Since they are derived exclusively from the atmosphere, the wisdom in allowing the accumulation of these food constituents by simply postponing harvesting to the glazing condition becomes at once apparent.

It will now be of interest to discuss these chemical data in connection with the yields per acre obtained in the experiment, and for that purpose the following table has been prepared. A careful study of its details reveals many points of interest, but it will perhaps be sufficient on the present occasion to remark that all that has been said regarding increased feeding value of the maturer corn received additional emphasis. The last column shows that the gain in food constituents per acre between the tasselling and glazing periods amounted in this experiment to 2 tons 831 pounds.

The Chemistry of the Corn Plant.—Table III.

Weights of the Constituents per Ton and per Acre in Green Material.

Stage of Growth.	Pounds per Ton. Ash.	Protein (Albuminoids).	Fibre.	Nitrogen—free extract (Carbo-hydrates)	Ether extract (Fat).	Total Dry Matter.	Total Weight of Green Fodder per Acre. Tons.	Lbs.	Tons and Pounds per Acre. Ash.	Protein (Albuminoids).	Fibre.	Nitrogen—free extract (Carbo-hydrates)	Ether extract (Fat).	Total Dry Matter.
Tasselling	25·0	30·2	88·8	118·0	23·4	285·4	22	1318	0 566	0 684	1 12	1 674	0 530	3 466
Silking	24·8	28·0	106·8	143·0	20·6	323·2	24	52	0 596	0 673	1 566	1 1436	0 495	3 1766
Early milk	21·6	28·6	114·2	191 2	33·4	389·0	22	1806	0 495	0 655	1 615	2 379	0 765	4 909
Late milk	21·0	31·0	111·8	243·4	35·6	442·8	21	798	0 449	0 663	1 390	2 1204	0 761	4 1467
Glazing	21·6	34·2	122·4	306·6	38·8	523·6	21	1154	0 466	0 738	1 641	3 615	0 837	5 1297

It is well understood that it is the digestible part of a fodder which is of service to the animal in keeping up the vital heat, in producing energy and the formation of tissues. It, therefore, becomes of importance to inquire as to whether the digestibility of the food constituents of the corn plant becomes impaired in the latter stages of growth. Though we have no Canadian data on this point, experimental research in the United States would go to show that there is no marked decrease in digestibility until after the corn has passed the glazed period. We may, therefore, safely assume that no deterioration in feeding value has occurred if the corn is cut at that stage. Taking the usually accepted

co-efficients of digestibility in connection with the data already given, we have the following figures:—

The Chemistry of the Corn Plant.—Table IV.

Digestible Matter in Corn Fodder at Different Stages of Growth.

Stage of Growth.	Digestible Matter in One Ton.	Digestible Matter per Acre.
	Lbs.	Lbs.
Tasselling	186·2	4,220
Silking	211·0	5,069
Early milk	256·5	5,873
Late milk	285·9	6,012
Glazing	339·2	7,308

Summing up these details, there is an increase of 153 pounds per ton, or 3 tons 88 pounds per acre, of digestible constituents stored up within the five weeks preceding the glazing condition.

There appears to be little, if any, assimilation of plant food after this period is reached, and the probability is that the fibre becomes dry and hard by over-ripeness, thus impairing the digestibility of the fodder.

THE RELATIVE FEEDING VALUE OF CERTAIN ROOT CROPS.

Of the many interesting and as yet unsettled questions in cattle feeding, our attention has, this year, been directed towards the solution of one that relates to the relative feeding value of certain roots. The work accomplished is by no means complete, but the data obtained furnish some facts which will be helpful in coming to a decision on this subject. In January last we received, through the kindness of Messrs. Ewing & Co. of Montreal, samples of the following turnips: Pomeranian White Globe, Elephant Purple Top Swede and Green Top Yellow Aberdeen. The roots were grown on the farm of Mr. Duncan McLachlan, Petite Côte, near Montreal, in the same field. They were sown at the same time, and stored in the same cellar. The soil is reported as "medium loam and rich," and "the season as a dry one." The analysis of the roots was put in hand on their arrival, and the following data obtained.

NOTE.—Much of this information was brought before the Select Committee on Agriculture and Colonization, but as the printed proceedings of the committee have only a limited distribution, it has been thought advisable to present them here for the general information of the agricultural public.

Analysis of Roots.

———	Pomeranian White Globe.	Elephant Purple Top Swede.	Green Top Yellow Aberdeen.
Water	91·86	88·56	90·36
Dry matter	8·14	11·44	9·64
	100·00	100·00	100·00
Protein or albuminoids	1·04	1·09	1·01
Fat	0·05	0·06	0·04
Carbo-hydrates	4·58	8·25	6·06
Fibre	1·30	1·13	1·45
Ash	1·17	0·91	1·08
	8·14	11·44	9·64

Taking these data as a basis for comparison, we must conclude that, weight for weight, the Elephant Purple Top Swede is the best, the Green Top Yellow Aberdeen ranking second, and the Pomeranian White Globe, third, as regards feeding value. This conclusion is based on the relative amounts of carbo-hydrates, for the percentages of the other food constituents are so close as to be approximately the same.

The contention of Mr. Ewing is that "the Green Top Yellow Aberdeens will produce 25 per cent more crop (in weight) than Swedes, and that an acre will, therefore, produce more nutriment, on account of this excess of crop, than an acre of Swedes. He further states that in a cool cellar "the Aberdeens will keep perfectly well till May, at least."

The fact must not be lost sight of that both the yield and composition of roots are markedly affected by the character of the soil and the nature of the season, and therefore ultimate conclusions must be drawn with care from analyses covering diverse conditions.

OIL-CAKE MEAL AND GERM MEAL.

The development of the dairying industry in recent years has given rise to much thoughtful inquiry as to the relative nourishing values of those concentrated foods now upon our markets, and which are used to supplement the coarse home grown fodders. Such feed stuffs are principally the various grains and certain milling and manufacturing by-products. These are rich either in albuminoids (flesh formers) or fat—and sometimes in both, consequently their price is high. Their economical purchase and profitable use, therefore, necessitates a knowledge of their composition ; and this is more especially true of the by-products, since their methods of preparation and the forms in which they are sold allow considerable latitude to the manufacturer or vendor, who, unlike the fertilizer manufacturer or vendor, is not compelled by law to give any guarantee as to purity or composition.

In former reports we have considered the composition of foods in general and given an account of the functions of their constituents in the animal. (See reports, 1890–1893.) To these the reader is referred for information regarding the fundamental principles of the subject.

In the subjoined table the composition of two brands of oil-cake meal and one of germ meal analysed last May is shown. These data are supplemented by figures obtained in the farm laboratories in 1890, now added for the sake of comparison.

COMPOSITION OF OIL-CAKE MEAL AND GERM MEAL.

No.	Material.	Water.	Albuminoids.	Fat.	Fibre.	Carbo-hydrates.	Ash.
1	Oil-cake meal	6·88	33·79	3·83	8·02	41·36	6·12
2	do	6·59	38·12	5·03	6·62	38·47	5·17
3	do	7·49	29·71	5·71	9·70	39·87	7·52
4	do	8·64	34·89	5·21	9 13	36·86	5·27
5	do	10·06	33·19	5·59	8·41	37·01	5·74
6	Germ meal..	10·20	17·37	6·95	8·59	56·20	0·69
7	do	8·64	10·25	8·39	7·77	62·32	2·63

No. 1.—Oil-cake meal, sent by D. James, Thornhill, Ont.; bought from Steele, Briggs & Co., and manufactured by Body & Noakes, Winnipeg, Man.

No. 2.—Oil-cake meal, sent by D. James, Thornhill, Ont.; bought from Steele, Briggs & Co., and manufactured by Wright & Hill's Linseed Oil Company, Chicago, U.S.

No. 3.—Oil-cake meal, from J. Livingstone, manufacturer, Baden, Ont. This and the two following samples were analysed in 1890.

No. 4.—Oil-cake meal, manufactured by Mann & Co., Buffalo, U.S.

No. 5.—Oil-cake meal, manufactured by Wright & Hill, Chicago, U.S., old process.

No. 6.—Germ meal, forwarded by Mr. L. Simpson, Valleyfield, Que.

No. 7.—Germ meal, purchased by Wm. Blair from A. Gunn & Co., Halifax, N.S.

Oil-Cake Meal—In oil-cake meal and cotton seed meal we have the most concentrated foods upon the market, *i.e.*, they possess the largest proportion of albuminoids (or protein) and fat. Oil-cake (or linseed cake, as it is frequently called) is a by-product in the manufacture of linseed oil. It varies in composition according to the kind of linseed used and the pressure and temperature at which the oil is extracted. To illustrate the use of chemical data in arriving at comparative nutritive value, we may examine the first two meals given in the foregoing table. This is very simply and, for practical purposes, sufficiently accurately done by adding together the percentages of fat and of the albuminoids and multiplying the total by two and a-half. To the result is added the percentage of carbo-hydrates. This final amount represents the percentage of so called "food units." These latter percentages, of course, indicate the relative nutritive values of the foods under comparison.

This method of interpreting analysis, while omitting the matter of the digestibility of the various constituents, gives within small limits the manurial as well as the feeding value. It is taken from Dr. Bernard Dyer's work "Fertilizers and Feeding Stuffs," page 81 et seq.

	No. 1.	No. 2.
Albuminoids	33·79	38·12
Fat or oil................................	3·83	5·03
	37·62	43·15
	2·5	2·5
	18 810	21·575
	75·24	86·30
	94·050	107·875
Carbo-hydrates	41·36	38·47
Food units..............................	135·41	146·345

No. 1 therefore contains 135 food units; No. 2, 146 food units, or one ton of No. 2 is equal in food value to 1 ton 166 pounds of No. 1. This difference is seen to be due to the larger percentages of albuminoids and oil in No. 2. If No. 1 were valued at $20 per ton, No. 2 would be worth $21.63 per ton.

Germ Meal.—This is a by-product from Indian corn in the glucose and starch factories, and usually consists of the husk and germ ground together. It is richer in albuminoids and fats than corn meal. Samples differ very much among themselves as regards composition, owing to the various methods of separation employed.

LACTEO-VITULINE (CALF MEAL).

A sample of this material was forwarded at the instance of the Hon. Louis Beaubien, Minister of Agriculture, Quebec, with a request for an analysis and report as to its feeding value.

It was imported from France, being sent by the Comptoir de l'Elevage at Tours, and the price stated is $12 per 100 kilos, or nearly five and a half cents per pound.

It is intended to be used, according to certain directions, as a substitute for milk in the feeding of calves. Of the several substances now upon the market for this purpose it is impossible to speak generally, some appearing to be almost worthless and others again while possessing a high nutritive value are sold at such exorbitant prices as to place them outside the category of economical feeding stuffs.

The basis or chief bulk of such concentrated feeds is in most instances ground Indian corn, linseed meal and pea meal, supplemented by shorts, oatmeal, &c., and frequently by some soluble saccharine material, such as glucose. To increase palatability, flavouring materials, such as anise seed and fennel are often incorporated.

Lacteo-vituline is a finely ground yellow meal with a distinctly sweetish taste and showing under the microscope abundant evidence of corn, linseed and pea meals.

Its analysis affords us the following data:—

Water	9·87
Albuminoids (nitrogenous substances)	16·00
Fat or oil	8·38
†Carbo-hydrates (starch and sugar)	61·68
Fibre (cellulose)	1·17
*Ash (mineral matter)	2·90

For the purpose of comparison, the composition of some of the more common meals in use is given in the following table:—

—	Corn Meal.	Wheat Shorts.	Wheat Bran.	Pea Meal.	Linseed Meal (old process).
Water	10·9	11·8	12·0	10·5	9·2
Albuminoids	10·5	14·9	16·1	20·2	32·9
Fat	5·4	4·5	4·2	1·2	7·9
Carbo-hydrates	69·6	56.8	53·7	51·1	35·4
Fibre	2·1	7·4	8·4	14·4	8·9
Ash	1·5	4·6	5·6	2·6	5·7

Considering it from the standpoint of its composition, Lacteo-vituline appears to be a well balanced, nutritious and readily digested food, though the relative proportion of its constituents is not such as exists in whole milk. This is made the more obvious by

†Containing 9·76 per cent soluble saccharine matter.
*Composed chiefly of the phosphates, chlorides, sulphates and silicates of lime, soda and potash.

comparing the analysis of milk with that of the artificial milk prepared with this meal according to directions, which are as fo'lows :—

Mix 200 grammes (about 7 ounces) with 3 litres ($3\frac{1}{10}$ quarts) of hot water and add to 3 litres of fresh, unskimmed milk, to be fed, luke warm, in three parts during the day.

AMOUNTS of principal food constituents, in grammes per litre in artificial milk prepared with Lacteo-vituline and in cow's milk.

—	One litre of artificial milk, prepared by adding 200 grams of Lacteo-vituline to 3 litres of water.	One litre of cow's milk.
Albuminoids	10·7	34·0
Fat	5·6	37·0
Carbo-hydrates	41 1	49·0
Ash	1·9	7·0

Respecting the relative food value and cost we can establish a comparison in the following manner, using the generally accepted co-efficients of digestibility and the proportional value of 1 : 2·5 : 2·5 for the respective values of carbo-hydrates, fat and albuminoids. One litre of the artificial milk prepared as above, cost eight-tenths of a cent, and we may assume the cost of producing one litre of milk to be one and a half (1·5) cent.

Artificial Milk.	Cow's Milk.
$\frac{41{\cdot}1 \times 93}{100} \times 1 \quad = 38{\cdot}22$	$\frac{49 \times 95}{100} \times 1 \quad = 46{\cdot}55$
$\frac{5{\cdot}6 \times 75}{100} \times 2{\cdot}5 = 10{\cdot}50$	$\frac{37 \times 99}{100} \times 2{\cdot}5 = 91{\cdot}57$
$\frac{10{\cdot}7 \times 89}{100} \times 2{\cdot}5 = 23{\cdot}81$	$\frac{34 \times 94}{100} \times 2{\cdot}5 = 79{\cdot}90$
72·53	218·02
$\frac{\cdot 8}{72{\cdot}53} = \cdot 011$ cents=cost of food unit.	$\frac{1{\cdot}5}{218\ 02} = \cdot 007$ cents=cost of food unit.

Though no claim is made that the factors used in the above calculation are strictly correct (indeed they are necessarily but approximate), their application to both materials under consideration allows us to make a fair comparison as to the relative values of these foods. Valuing milk at 75 cents per 100 pounds (the value used in the above calculation), we find that the price of the food unit in the artificial milk, prepared according to directions, is one and two-thirds greater than that in the same quantity of cow's milk. It is quite possible that practical experience might alter this ratio, but it is scarcely to

be expected that at the price quoted for lacteo-vituline it will be in favour of this preparation.

The directions furnished state that at the end of 45 days milk may be altogether discontinued and an artificial milk prepared by mixing 500 grammes (about $17\frac{1}{2}$ ounces) with 9 litres ($9\frac{1}{3}$ quarts) of water. The cost of this quantity would be six (6) cents.

After the first three weeks of the calf's life, substitutes, at all events in part, for whole milk can profitably be fed, but, with the comparatively low price of concentrated feeds now prevalent in Canada, it would seem that a judicious mixture of linseed meal, shorts, pea meal, corn meal, &c., together with saccharine refuse from the sugar refinery or glucose factory, could be prepared at much less cost than the material here under consideration.

THE FEEDING VALUE OF BROKEN HOP VINES.

The material was received from the farm of Prof. R. Carr-Harris, in Bathurst, N.B., who was anxious to employ it for feeding purposes if it proved to have any nutritive value, since large quantities were procurable at the close of the hop season, which hitherto had been put to no use. Mr. W. E. Serson, the manager of the farm referred to, had made some trials with it and reported against it.

The sample consisted of dry, hard fragments of vine, from one-sixteenth of an inch to half an inch in length, and exceedingly woody in nature. Our analytical results are as follows :—

ANALYSIS—HOP VINE—*Air-dried and Ground.*

Water	8·69
Fat	·70
Albuminoids	2·53
Fibre	50·16
Nitrogen free extract (carbo-hydrates)	33·31
Ash or mineral matter	4·61
	100·00

It is very apparent that the feeding value is exceedingly low. It certainly contains small amounts of nutritive constituents, but these are associated with such a large quantity of fibre, which is of a particularly hard and woody character, that I consider this material, as regards digestibility, as much inferior to straw.

Unless the material were well soaked and fermentation induced, it is more than probable that the hard and sharp nature of the fragments would cause considerable irritation to the animals' digestive organs, possibly with fatal results.

Since the hop vines contain considerable amounts of nitrogen, potash and phosphoric acid, it is suggested that they should be composted with barnyard manure, thus liberating in available form the plant food. If the vines prove too woody to succumb to this treatment, they could be burnt. This would result in the loss of the nitrogen, but all the potash and phosphoric acid would be present in the ashes.

WELL WATERS FROM FARM HOMESTEADS.

For a number of years we have been calling attention to the necessity of more care being exercised in the protection of the farm water supply from contamination. In the past we have observed that a very large proportion of the samples of well waters sent for analysis has been polluted and unfit for household use, and the same is true of this year's results.

It is difficult to add anything further to what we have written in previous reports regarding the grave risk to health incurred in using polluted water. It has been

repeatedly shown that water containing excrementitious matter is decidedly injurious to the general health and that it is often the means of spreading typhoid and other serious and infectious diseases. To those who value their health and that of their family, to those who would have strong and thrifty animals, to those who desire pure milk and first-class butter, we would say that it is of primary importance that the water supply should be from a source beyond suspicion, and that this source should be carefully guarded against pollution by infiltration of drainage matter.

The waters analysed this year and reported in the following table were received from the various provinces, as follows:—British Columbia, 6; Manitoba, 1; Ontario, 28; Quebec, 7; New Brunswick, 2. Of these waters 45 per cent were very seriously contaminated and condemned as quite unfit for use; 20 per cent were returned as suspicious and, in all probability, unsafe; while 35 per cent proved to be unpolluted and wholesome.

From a consideration of the information sent with the samples respecting these wells and their environment, there is no doubt in the writer's mind that, in the majority of instances, the pollution, as shown by the chemical data, is derived from the drainage of the farm buildings and barnyard, and is consequent upon two causes—the location of the well and the dirty condition of its surroundings. When that most pernicious practice of sinking the well in the stable or barnyard is followed, provision is really being made to collect, as in a cesspool, liquid manure. The amount of manure, the rainfall and the porosity of the soil are the chief factors that will determine the date of the contamination of such wells; it is only in *very exceptional cases* that they can escape pollution. Let those about to sink wells, therefore, remember that they should not be dug in or near the barnyard nor under of the farm buildings. Not a little of this rural well-water pollution is due to the filthy state of the buildings and yard. Much of it could be prevented by a more liberal use of absorbents (see article on air-dried muck) and by a greater carefulness in keeping clean the barnyard. There is room for much reform and improvement in this matter.

The well, being sunk at a safe distance from possible sources of pollution, the brick and stone work should be coated to the ground water line with a cement impervious to water. This will protect the well from infiltration of drainage from the upper layer of the soil. Further, a tight-fitting top should be provided rising to the height of 9 inches or 1 foot above the surface of the surrounding ground. This will prevent surface water, mice, rats and frogs from entering. The household slops, garbage, &c., should never be thrown on the soil in the neighbourhood of the well; their proper place is the compost heap. Finally, the well should never be used as a cold storage receptacle, nor the dairy or other vessels washed at the well unless there is an ample provision by a well constructed drain to take away the wash water.

The sketch of a barnyard on page 220 illustrates the way in which the barnyard well becomes polluted with soakage from the barnyard, manure pile and privy.

ANALYSIS OF

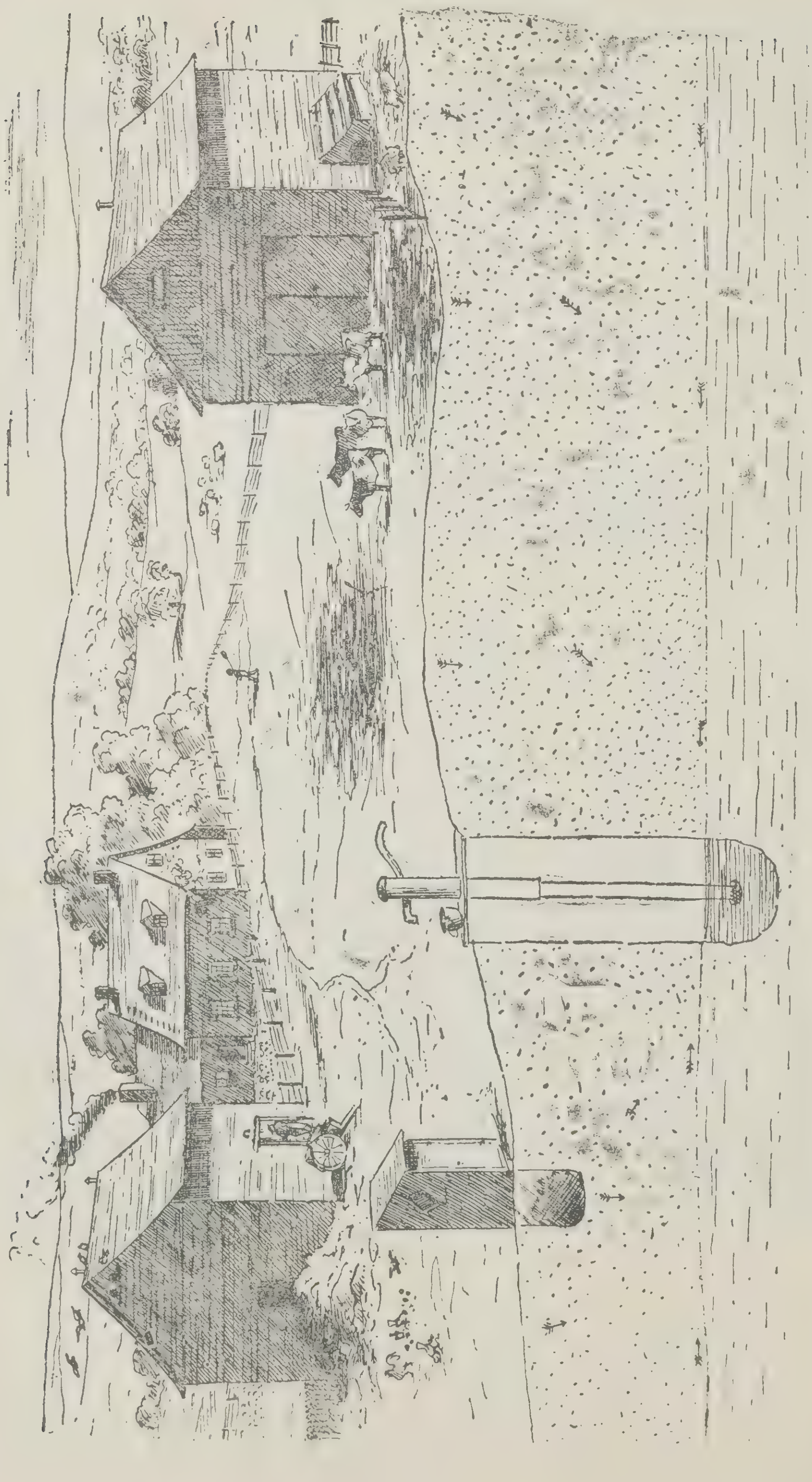
RESULTS STATED

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.
			1895.				
1	Napanee, Ont.	J. B.	Nov. 11..	0·506	0·096	0·064	80·0
2	Nepean Tp., Ont.	J. H. S.	" 22..	0·03	0·175	0 118	1·8
3	Barton Tp., Ont.	W. G. W. (J. C.) No. 18.	" 22..	1·846	0·05	0·087	850·0
4	"	W. G. W. (No. 19)	" 22..	0·012	0·04	0.01	7·4
5	"	W. G. W. (J. C.) No. 20.	" 22..	trace.	0·032	0·0263	18·6
6	"	W. G. W. (W. M.) No. 21.	" 22..	trace.	0 058	0·0873	4·8
7	Hillier, P. E. Co., Ont.	L. P. H.	Dec. 2..	20·0	....	......	1020·0
8	Almonte, Ont.	J. B. W. (No. 1)	" 4..	1·16	0·178	0·0412	7·8
9	"	J. B. W. (No. 2)	" 4.	trace.	0·09	0·066	2·4
10	"	J. B. W. (No. 3)	" 4..	0·08	0·067	2·553	264·0
11	Long Lake, Vernon, B.C.	G. G. (No. 1)	" 18..	0·045	0·065	0·0124	1·0
12	" "	G. G. (No. 2)	" 18..	0·05	0·076	0·025	1·0
			1896.				
13	North Bend, B.C.	J. H.	Jan. 13..	trace.	....	....	1·0
14	St. John, N.B.	G. H. E.	" 27..	0·02	0·02	0·9619	21·0
15	Knowlton, Que.	R. W.	Feb. 22..	0·112	0·04	0·6983	12·0
16	Apohaqui, N.B.	G. W. Mc.	" 27..	0·034	0·13	0·0214	10·5
17	St. Jacobs, Ont.	B. & S. (No. 1)	" 27..	0·207	0·02	0·041	5·2
18	"	B. & S. (No. 2)	" 27..	0·27	0·02	none.	4·5
19	Knowlton, Que.	R. W. (No. 1)	Mar. 24..	0·01	0·02	0·8814	1·0
20	"	R. W. (No. 2)	" 24..	0·016	0·024	1·823	28·4
21	"	R. W. (No. 3)	" 24.	0·014	0·065	4·172	29·4
22	Milverton, Ont.	R. R. (No. 1)	April 11..	0·02	0·055	3·864	126·0
23	"	R. R. (No. 2)	" 11..	trace.	0·11	9·187	112·0
24	Vernon, B.C.	L. N.	" 15..	0·05	0·034	1·013	15·5
25	Port Sydney, Ont.	W. E. (No. 2)	" 20..	0·01	0·675	0·19	3·0
26	"	W. E. (No. 1)	May 6..	0·025	0·77	2·631	17·0
27	Chilliwack, B.C.	J. S. M.	June 9..	0·08	0·05	0·033	1·0
28	" River, B.C.	J. S. M.	" 9..	0·4	0·09	0·033	1·0
29	Calumet, Que.	R. L.	July 28..	0·02	0·10	4·21	47·5
30	Hintonburg, Ont.	R. E.	Aug. 5..	0·11	0·324	1·21	11·0
31	Orillia, Ont.	W. S. F. & Co.	" 6.	0·12	0·06	1·103	4·0
32	Aylmer, Que.	A. C. C.	" 13..	trace.	0·08	1·005	3·0
33	Richland, Man.	A. M.	" 17..	0·064	0·045	0·054	1·20
34	Norham, Ont.	J. B. S. & Son.	" 20..	none.	0·024	0·05	6·0
35	Bronte, Ont.	W. G. W. (No. 22)	" 20..	4·89	0·04	....	1350·0
36	"	W. G. W. (M. T., No. 23).	" 20..	0·03	0·026	4·957	6·2
37	Weston, Ont.	W. G. W. (J. W., No. 24).	" 20..	0·01	0·024	0·0247	16·1
38	"	W. G. W. (A. S., No. 25).	" 20..	1·395	0·02	1·207	220·0
39	Welland, Ont.	R. McC.	" 24..	1·002	0·04	0·0477	118·0
40	Billings' Bridge, Ont.	J. K.	Sept. 2..	none.	0·13	0·708	7·0
41	Port Sydney, Ont.	J. E. C.	" 8..	0·030	0·2425	1·363	2·0
42	Tavistock, Ont.	H. R. (Dr. W.)	" 14..	0·06	0·07	6·605	180·0
43	Angers, Que.	J. P.	" 16..	3·286	none.	none.	1680·0
44	Douglas, Ont.	S. F. B.	Oct. 14..	0·43	0·336	0·086	1·5

WELL WATERS, 1896.

IN PARTS PER MILLION.

Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
508·0	384·0	124·0	Slight trace....	Serious pollution ; not safe for household purposes.
......	......	......	....	Contamination not indicated, but certain suspicious features.
4048·0	3196·0	852·0	....	An exceedingly bad water.
414·0	331·2	83·0	Very slight trace..	A good water.
145·2	117·2	28·0	" ..	Probably a wholesome water, but certain data render it suspicious.
516·8	425·2	91·6	....	A good water ; free from pollution.
......	190480·0	......	....	Very bad ; exceedingly dangerous to use.
445·6	390·0	55·6	Slight trace......	Polluted from drainage of cheese factory.
308·8	296·8	12·0	Very slight trace..	A good and wholesome water.
1028·0	772·0	356·0	....	Well receives pollution.
192·0	153·6	38·4	Very slight trace..	Wholesome and fit for drinking purposes.
190·8	160·8	30·0	Trace............	" "
422·0	385·0	37·0	....	A good water.
176·0	174·8	1·2	None............	Most probably a very good water.
182·8	135·6	47·2	....	Polluted ; not safe for household use.
2492·4	2043·6	348·8	Heavy trace ..	Free from organic pollution ; mineral matter very high.
2772·4	2142·4	630·0	None............	Not within the limits of good wholesome water.
2171·6	1790·0	381·6	"	" "
60·0	43·6	16·4	Trace....	An excellent water in every respect.
252·0	176·0	76·0	Heavy trace......	Polluted ; unsafe for household use.
236·0	196·0	40·0	"	A very bad water ; quite unfit for use.
668·0	438·4	229·6	"	Polluted, cannot be considered a safe water.
632·0	456·8	175·2	Considerable trace.	Very seriously contaminated.
406·8	336·4	70·4	Heavy trace......	Has suspicious features.
77·0	45·0	32·0	Trace............	Free from pollution ; good and wholesome.
200·0	145·0	55·0	Heavy trace......	Polluted with drainage matter.
106·5	83·5	23·0	None............	Well water ; not first-class.
136·5	98·0	38·0	Heavy trace......	Of doubtful purity.
259·0	175·0	84·0	....	Decidedly suspicious.
402·4	308·8	93·6	Trace............	Considered unsafe for drinking purposes.
270·0	234·0	36·0	Heavy trace......	Condemned for drinking purposes.
292·0	190·0	102·0	Trace............	Suspicious ; its wholesomeness is doubtful.
366·0	283·2	82·8	Heavy trace......	Perfectly wholesome and free from contamination.
319·6	283·6	36·0	Trace............	Of excellent quality and free from pollution.
3914·0	3463·2	450·8	....	An exceedingly bad water.
459·3	393·0	66·3	Trace............	Probably a safe water
294·0	223·2	70·8	None............	An excellent water ; perfectly wholesome.
1029·2	966·0	63·2	Heavy trace......	Most seriously polluted.
3832·0	2944·0	888·0	Fair trace........	Impure and unwholesome ; polluted.
279·0	209·0	70·0	Trace............	Free from pollution ; wholesome.
80·0	35·0	45·0	Heavy trace......	Suspicious.
740·0	575·2	164·8	"	Condemned as unsafe ; seriously polluted.
4016·0	3136·4	879·6	"	Very seriously polluted; use attended with grave risk to health
190·0	160·0	30·0	Trace............	Could not be recommended as a wholesome water.



SKETCH showing how the barnyard well may become polluted by soakage from the barnyard, the manure pile and the privy. The arrows indicate the direction of the drainage, the well acting as a cesspit.

Analyses of well waters are made free of charge, provided the sample is taken according to the directions furnished on application, and the express charges are prepaid. It is absolutely essential that the instructions issued for collection of the water should be faithfully followed. Numbers of samples received at the laboratory are never analysed, owing either to an insufficient quantity of the water, or to the fact that dirty bottles or used corks have been employed.

REPORT

OF THE

ENTOMOLOGIST AND BOTANIST.

(JAMES FLETCHER, LL.D., F.R.S.C., F.L.S).

DR. W. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to hand you herewith a report on some of the most important subjects which have been brought officially under my notice during the past season. The correspondence of this division is now very large, which I trust may be taken as an indication of the growing appreciation of the utility of the investigations prosecuted. As heretofore, I have endeavoured to come into direct communication with my many correspondents in all parts of Canada, so as to benefit as much as possible from the observations of practical workers and actual eye-witnesses of the different matters studied. It is of course impossible to treat in the annual report of all the subjects which engage the attention of the Entomologist and Botanist during the year; but the many valuable data and records of observations in letters from correspondents are all carefully preserved and classified for future use when the subjects to which they refer are treated of in full. Included among these are references to various attacks upon crops, of more or less importance by insects, the study of the life histories of which is as yet incomplete. As in previous years, much time has been taken up in distributing information concerning well known injurious insects and plants. Among the insects which cause much loss every year and which are now being studied with the view of arriving at better remedies, the following may be mentioned :—Wireworms, cutworms in grain, the pea moth, the strawberry leaf-roller, the carrot rust-fly, the "fish-bug" *(Silpha Lapponica*, Hbst.), which attacks codfish on the "flakes" during the process of being cured, root-maggots of the onion and cabbage and white grubs.

The experiments with grasses and fodder plants of all kinds have been continued upon the Experimental Farm, and a large number of small samples of seeds have been distributed to farmers living in all parts of the Dominion for testing. The reports from these correspondents are of great interest as proving the suitability of some of the valuable varieties for cultivation over a far wider area in the Dominion than might have been anticipated. The experimental grass plots on the farm continue to be of great interest to visitors. In these plots may be seen growing nearly all the grasses, clovers and other fodder plants suitable for cultivation at Ottawa, of which the seeds are to be obtained from seedsmen as well as a large number of our native Canadian grasses. Seeds have also been procured from botanists in Australia and in the United States. Among these mention may be made of an erect variety of barn-yard grass (*Panicum Crus-galli*) and two early varieties of Soja beans from Japan received from Prof. W. P. Brooks, of the Massachusetts Experiment Station.

During the past year many entomologists and botanists in various parts of the Dominion have availed themselves of the services of the officers of this division in identifying specimens of insects and plants. A large number of collections have been received for this purpose. From these collections several valuable additions have been made to the farm museum The collections sent in for naming are always returned to the senders with the names of the specimens, but many species which were found to be desirable for our herbarium have been kindly presented to us by their owners upon that fact being made known to them. Through these collections valuable additional information is acquired as to the known distribution of our native insects and plants, lists of the names, localities and dates of all specimens received being carefully kept.

The practical work of the Arboretum and Botanic garden, which was done to a large measure under my direction until last spring, was then, at my request, handed over to Mr. W. T. Macoun, the foreman of forestry, who, having men under his control, was in a better position to look after the necessary labour, such as cultivation, planting, tidying up, &c., than I was, with only one man, whose time is very fully occupied with the grass and fodder experiments. In addition to the above reason, Mr. Macoun is specially well qualified for this work from his natural tastes and knowledge of plants. I had, therefore, very much pleasure in recommending to you that this work should be entrusted to him.

Whenever my official duties would allow of my absence, every opportunity has been taken of attending farmers' meetings to deliver addresses on the work of the division and to meet the farmers. In this way information concerning the work of this division has been spread to many who might not otherwise have known of its utility. Meetings were attended at the following places:—

January 7–10—Campbellford, Ont.
do 14–16—Cornwall, Ont.
February 7–8—Toledo and Newboro', Ont.
do 10–15—St. Johns and Ormstown, Que.

By instruction of the Hon. Minister of Agriculture, and at the request of the Manitoba government, I proceeded to Manitoba on 23rd June last, and, in company with Mr. Hugh McKellar, Chief Clerk of the Provincial Department of Agriculture and Immigration, or Dr. S. J. Thompson, Veterinarian of the same department, I held a series of twenty meetings in many of the most important wheat growing centres of Manitoba. The subject treated of at all these meetings was "Noxious Weeds, their Nature and Habits, and the best Means to adopt for their Eradication." These meetings were in every case well attended and very great interest was manifested in the subject, large numbers of weeds being brought in at every meeting for naming and information. All arrangements and expenses of these meetings were undertaken by the Provincial Minister of Agriculture, the Hon. Thomas Greenway, who, by associating with me in this work the two above named officers of his department, materially increased the value of the meetings on account of the practical knowledge and long experience of both of these gentlemen in the methods of culture practised in Manitoba, as well as their thorough acquaintance with the capabilities and physical features of the country.

Acknowledgements.—As in previous years, I am under great obligations to my friends, Prof. John Macoun and Mr. W. H. Harrington, for frequent assistance in the identification of difficult plants, insects and other objects of natural history. To Mr. J. B. Tyrrell, of the Geological Survey Department, I am indebted for the identification of specimens of *Arachnidæ.* I also take pleasure in again gratefully acknowledging the valuable assistance I have received from my many correspondents in all parts of the Dominion, who have much aided the work of this division by making observations and by sending me prompt notice of the occurrence of injurious insects and weeds. My thanks are particularly due to Dr. L. O. Howard, the United States Entomologist, and his staff for many favours in the identification of insects, for the use of illustrations and for valuable publications. The following donations have been received, all of which are most acceptable:—

J. R. Anderson, Esq., Victoria, B.C.—Botanical specimens and living roots of five species of British Columbian *Ribes.*

André Bôdy, Esq., Quebec.—Botanical specimens and seeds.

Rev. W. A. Burman, Winnipeg.—Seeds and specimens of Manitoba weeds.

F. C. Clare, Esq., Edmonton, Alta.—Specimens of rare plants and insects from the North-west.

M. G. DeWolfe, Esq., Kentville, N.S.—Living root of *Amorphophallus Rivieri.*

A. Grant Ferrier, Esq., Sorrento, Florida.—Insects from Florida, including a living specimen of the whip-tailed scorpion *(Thelyphonus giganteus).*

T. W. Ramm, Esq., Ross Mount, Ont.—Specimens of insects, including a beautiful pair of the Imperial Moth *(Eacles imperialis,* Drury) taken in Ontario.

W. Scott, Esq., Toronto.—Botanical specimens.
Rev. G. W. Taylor, Nanaimo, B.C.—British Columbian plants and insects.
T. N. Willing, Esq., Olds, Alta.—Rare plants and insects from Alberta.
The Director, Bangalore Botanic Garden, India.—Several packets of seeds.

In addition to the above special mention should be made of a consignment of specimens of the Apricot scale, *Lecanium Armeniacum*, infested by its parasite, *Comys fusca*, Howard. These were sent by Mr. E. M. Ehrhorn, of Mountain View, California, with the hope that they might prove useful in controlling the New York Plum-scale, a species similar to the Apricot scale. Part of these specimens were allowed to escape in an elm tree at Ottawa badly infested by another *Lecanium* very similar to the two above mentioned, and part were sent to Mr. L. A. Woolverton, Secretary of the Fruit Growers' Association of Ontario, to be liberated at Grimsby where the New York Plum-scale was known to exist.

The most important addition to the museum was in the shape of an exchange from the Government of New South Wales, through the Curator of the Technological Museum at Sydney, and consists of a large collection of named botanical and entomological specimens from that colony.

In conclusion, I beg again to acknowledge the great help I have received in all branches of my work from my assistant, Mr. J. A. Guignard, B.A., who has done a great deal to render this division what I trust and confidently hope that it is—a useful branch of the public service.

I have the honour to be, sir,
Your obedient servant,

JAMES FLETCHER,
Entomologist and Botanist.

OTTAWA, 31st December, 1896.

CEREALS.

There was not during the past summer any widespread or very serious injury to grain crops by insect enemies. Notwithstanding that in the province of Ontario large areas of fall wheat were ploughed down as being "winter-killed," the crop proved of good quality and an average yield. It is highly probable, from the reports that have since come in from the districts where this winter killing prevailed, that some of the loss, at any rate, was due to the attacks of the HESSIAN FLY *(Cecidomyia destructor*, Say*)*, Fig. 1. Actual reports mention this insect only in Prince Edward Island and the western part of Ontario. In this latter section, however, there is decided evidence that the Hessian fly is increasing, and it is well for farmers to recognize this and adopt the well known methods for preventing its injury. In October last Prof. J. H. Panton, of the Ontario Agricultural College and Director of the Committee on Economic Botany and Entomology of the Ontario Agricultural and Experimental Union, sent out a list of questions to some of the most prominent farmers in Ontario. One of these questions was: "What are the six worst insects in your locality?" And another: "What new insects are likely to be injurious?" In an interesting summary of the replies to these questions, written by Mr. T. F. Paterson for the Montreal *Family Herald* of December 15, 1896, it appears that "forty-three different insects were enumerated. The following list will give a fair estimate as to which are most injurious to the farmer at the present time. The eight worst ones have been selected, as, from the reports, they seem to greatly exceed the others in numbers and injurious effects:—1. Colorado potato beetle, 39. 2. Grasshoppers, 32. 3. Horn-fly, 25. 4. Cutworms, 18. 5. Tent caterpillars, 15. 6. Army-worm, 13. 7. Cabbage worm, 11. 8. Hessian fly, 10." From the above, it is also clear that the Hessian fly is recognized as the cause of considerable loss in the year 1896, and in the answers to the question as to what insects are likely to prove troublesome in the future it is the fifth of twenty-three kinds mentioned, and the Wheat Midge is the sixth. The following letters are from Ontario:—

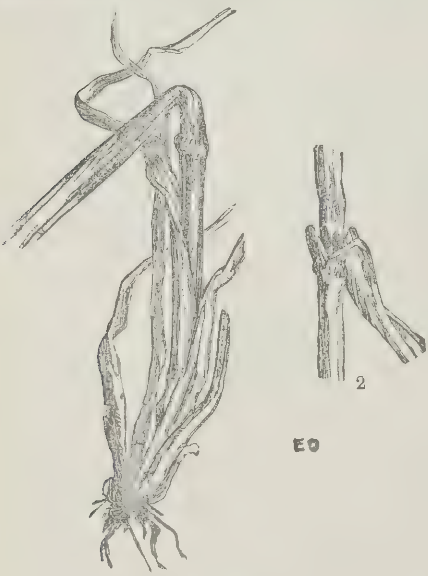


Fig. 1.—Barley stem attacked byHessian fly. 2, Showing flax-seed-like puparia.

"Pinehurst, Kent Co., Ont., 29th June.—In this county the Hessian fly is doing a great deal of damage to the wheat crop; in fact, many fields are ruined, and, unless something can be done to protect the wheat, we think it a great risk to sow any this fall."—J. T. O'KEEFE.

"Delaware, Middlesex Co., Ont., 2nd Nov.—I am told that the prospects for fall wheat are not good in this neighbourhood, owing to the attack of the larvæ of Hessian fly."—J. DEARNESS.

"Verdun, Huron Co., Ont., 1st Dec.—Referring to previous correspondence, I am beginning to think that the Hessian fly may be blamable for the injury to my fall wheat this autumn; and, if so, there is every year here much loss from it. Much complaint was made last spring of fall wheat being killed off after it had apparently come through the winter all right, and I am now inclined to think, since communicating with you, that the Hessian fly was the cause of this loss also. The condition referred to extended over

ıll this township, and this fall much of the very early sowing (in August) is noticeably yellow in places. I have, however, examined a few fields, but did not find sufficient pupæ of the Hessian fly as would, I think, account for the whole of it. As to the extent of the damage to the wheat crop, six weeks ago as much as one-third apparently was injured, but this is not so noticeable now, owing to the killed plants having withered and the healthy ones covering the ground."—WM. WELSH.

The life history of the Hessian fly is well known, but fortunately this insect has not for some years required particular attention except in restricted localities. Its work is generally recognized in the spring of the year by dead plants in wheat fields. Upon examining these, the characteristic pupæ, resembling small flax seeds, may be found in the crowns of the young plants; sometimes three or four specimens will occur beneath the leaf sheaths of a single plant. In summer time the same flax-seed-like puparia (Fig. 1) may be found above the first or second joint of the stems of barley, rye and wheat, where they lie beneath the sheath of the leaf, but outside the stem; the larvæ suck the sap of the stems and so weaken them that they frequently fall down. The perfect insect is a tiny blackish midge with smoky wings, expanding only a quarter of an inch from tip to tip, which appears in April and May and again in August, lasting until about the middle of September. The females lay their minute scarlet eggs upon the inside crease of the leaves, and the young maggots, upon hatching, work their way down to the axils of the leaves where the injury to the plant is done.

Remedies.—The remedies for the Hessian fly are as follows: 1. Late sowing. The postponement of seeding until after the third week in September has the effect of delaying the appearance of the young wheat plants above the ground until all the Hessian flies of the second brood are dead.

2. Burning refuse. As a large proportion of the "flax seeds" are carried with the grain and at threshing are thrown down beneath the machine among the rubbish and broken straw, it is of great importance to destroy all rubbish, tailings or fine screenings wherever grain is known to be infested.

3. Treatment of stubbles. As soon as the crop is cut, it is an excellent plan to run a harrow over the fields so as to start a volunteer crop from the grains which have dropped in harvesting. By the time the fields are ploughed, many flies of the August brood will have emerged and laid their eggs on these plants; these will thus be destroyed at the same time as many seedlings of noxious weeds. If fields are conveniently situated away from barns, houses and stacks, much good may be done by burning over the stubbles before ploughing, as the pupæ occur, as a rule, at the first or second joint of the stem. To facilitate the operation of burning, a little dry straw may be scattered lightly over the stubble. It is, perhaps, hardly necessary to say that neither wheat, barley nor rye should be sown again in fields where a crop has been infested the year previous.

The JOINT-WORM (*Isosoma hordei*, Harris).—In my last report I made mention of the occurrence in injurious numbers of a joint-worm in wheat fields at Meaford, Grey Co., Ont. My correspondent, Mr. Thomas Harris, who reported his observations last year, writes that there has been no recurrence of this attack during the past summer on his own fields, nor has he heard of any upon the crops of his neighbours.

The GRAIN PLANT-LOUSE (*Siphonophora avenæ*, Fab.)—As usual, this plant-louse has occurred to some extent in all parts of the Dominion, but only two reports state that actual injury has been done to grain. That the insects were exceptionally abundant is shown by the following:

"Princeton, Brant Co., Ont., July 24.—In this part of the province we have begun to cut our oats, and these insects abound to an enormous extent. They literally cover the table of the binder. One farmer told me to-day that they piled up four or five inches deep under the knotter of his machine. I am sure I do not exaggerate when I say it would not be hard to sweep a good shovelful off a binder after cutting a field of oats."—J. E. RICHARDSON.

"Shakespeare, Oxford Co., Ont., July 27.—I send you some small insects. There are millions of them on my oats. I do not recollect having seen anything like it before."—J. W. DONALDSON.

"Doe Lake, Muskoka, Ont., August 18.—The wheat is very much shrunk here. This was not from rust, as the straw was bright, but the heads while green were covered with lice."—F. C. JUDD.

No special treatment can be recommended for the grain plant-louse, nor, as a rule, is any remedy necessary, for the natural parasites suffice to keep it in check.

The AMPUTATING BROCADE MOTH (*Hadena arctica*, Boisd.).—In the summer of 1895, the moths of this species were so abundant in some parts of Western Ontario as to attract the attention of many people, and complaints were received of their swarming into houses where they gave annoyance by soiling clothes and curtains and also by dying in large numbers in shop windows. As might have been expected, the caterpillars were last summer destructive in the same districts to wheat, oats, corn, &c., complaints coming in from the counties of Middlesex, Grey and Carleton. Writing from Granton, Middlesex Co., Ont., Mr. J. Dearness, President of the Entomological Society of Ontario, on 15th of May, says :—" I am sending you herewith samples of a cutworm that in innumerable force is ravaging spring crops sown on sod. The drill rows are followed, and every blade of grass is cut off, leaving large areas of the field perfectly bare. In this neighbourhood last year,—and from reports, I judge it was pretty general through this part of Ontario,—the Amputating Brocade moth was very troublesome, filling lamps, soiling clothes and pestiferous in other ways. I inclose one of these moths. Is it the same species as the cutworm sent?"

Reply :—" The cutworm and moth sent are both the same species. I am sorry to say that the only measure I can suggest by which infested fields can be turned to good use this year, is to plough up the portions worst affected and plant some crop which can be put in as late as possible, so as to give the caterpillars time to mature before the crop appears. It would be better to use some other crop than a plant belonging to the grass family. As far as my own observation goes, *H. arctica* feeds on grasses, although there are many records of the caterpillars feeding on other plants, such as root crops and even orchard trees ; but I have never seen this. They are large whitish cutworms nearly two inches long, with bright chestnut red heads, which exist a long time in the larval form, continuing their ravages almost to the middle of June. They have every appearance of caterpillars which feed normally beneath the surface of the soil."

Serious injury to corn fields, which was probably by the same species, was reported by Dr. T. Sproule, M.P., as occurring in the county of Grey.

The PEA MOTH (*Semasia* sp.) has again this year attracted a good deal of attention by the extent of its injuries. Many of the accounts differ somewhat on important particulars, and it is much to be regretted that, so far, all efforts to breed the perfect insect have failed, so that the exact identity of the moth cannot as yet be given. The following interesting letter adds to our knowledge of its life history :—

" Clifton, King's Co., N.B., February 24.—I have been greatly interested in your report on the Pea Moth. This insect is very destructive here, especially late in the season. Late pease are so damaged by it that they are quite unfit for use as seed unless hand-picked. Indeed I have had about all my late seed repeatedly destroyed. Last season, the late garden pease when picked and being prepared for the table were found to be so affected as to be unfit for market, fully three-quarters of them being destroyed by the worm. Late varieties of pease such as Stratagem were so injured that it was almost impossible to get any that were fit for seed.

"The pea pod is always attacked at the upper end first, and, when the pease are badly eaten up a quantity of granular excrement and silken threads unites the whole. The pods on the under side of vines lying on the ground seem to be most badly affected, and the damage is greater on ground planted in pease the year before, in garden plots, in damp positions and when the weather has been damp.

" I notice in your report that Mr. Cowdry says he found caterpillars only in pods quite matured. I have repeatedly found them in very young pods, too young for table use.

"This pest has existed here at least forty years, and I can see no appreciable increase or decrease. It causes considerable loss in this vicinity, but so far no remedy seems to be generally applicable. Possibly deep ploughing might do much, or burning the stems in garden plots."—J. E. WETMORE.

THE WHEAT-STEM SAW-FLY.

(*Cephus pygmæus*, L.)

Attack.—Slender, white grubs. Head rounded, yellowish, with the mandibles darkened. Body swollen at the first two joints after the head and tapering very slightly to the end, which is terminated by a short, blunt tubercle with a darkened and hardened tip. This Monsieur Herpin describes as a tubular appendage, which is capable of being protruded like a telescope, and assists the insect in its progress within the tube of the straw. Beneath the first three segments of the body are three pairs of rudimentary thoracic feet. These larvæ are found inside stems of wheat. When full-grown they are nearly half an inch in length and have by that time bored through all or most of the knots in the stem, leaving a discoloured tunnel extending from the top joint down to the root, where, when mature, they spin thin transparent cocoons in which they pass the winter and change to pupæ the following summer.

In November, 1889, Prof. Comstock published a bulletin (*Cornell Univ. Coll. of Agr., Bull. 11.*) "On a Saw-fly Borer in Wheat," in which he gives a full account of a remarkable outbreak of *Cephus pygmæus* on the Cornell University farm, when nearly five per cent of the wheat in a field was infested. In the *Canadian Entomologist* for 1890, page 40, Mr. W. Hague Harrington records that in 1887 he took a specimen of this insect at Ottawa, and that he had received specimens taken at Buffalo, N.Y., in the middle of June, 1888, and again at the same place and season the following year. With the exception of these records, I have been unable to find any mention of specimens being taken in America. On the 5th July, 1895, at Indian Head, N.W.T., I collected specimens of the perfect insect by sweeping the flowers of the Tumbling Mustard which grew in the greatest abundance just outside the Experimental Farm. At that time no injury by the larvæ was noticeable on the wheat growing in the district, nor has any report of injury attributable to it been received since from that district; but on the 6th of August last Mr. John Wenman, of Souris, Man., sent a packet of wheat stems containing nearly full grown larvæ which answered in every particular to those of *Cephus pygmæus*. Mr. Wenman was written to for full particulars of the occurrence, and the following letter was received:—

"Souris, Man., Sept. 2.—In reply to your favour of the 12th ultimo, I beg to inform you that I have looked several times for more specimens of the injured stems of wheat, but the field which was most visibly affected had been cut the day before your letter came, and I could not secure good specimens. You ask how it was that I noticed the injury. I observed that some straws were lying down or lodged here and there, and, upon examining these stems, I found in nearly every instance that the straw was discoloured and broken between the first and second joints. We had had hail a day or two before. On following up inside the affected stems, I found in most cases the grub which you saw in the sample sent, about half an inch long, head brownish and body cream-coloured. In one case I found the grub had worked through all the joints up to the head of grain. I looked for this pest in several of my neighbours' fields. I saw a little in one field. The damage resulting from this attack, however, is so far, I am sure, not appreciable, but precautions must, of course, be taken, and I shall be on the *qui vive* for any further visitation."

The specimens of straw sent by Mr. Wenman contained larvæ which were nearly or quite full-grown on the 12th of August, but only a small proportion of these stems had been tunnelled up to the top joint. The larvæ were some distance above the root, but judging from the state of maturity of the straw, they would have descended very soon to the root to form the cocoons in which they pass the winter.

There is, however, a marked difference in the season of the Manitoban specimens and that of those studied by Prof. Comstock at Ithaca, N.Y., which were in general terms just about one month earlier. By the 19th of July, 1889, all the larvæ examined at Ithaca had descended to the lowest joint, while in Manitoba this year, nearly a month later in the season, some of the larvæ were not full-grown until about the 13th of August. Specimens of the mature insect were flying at Indian Head on the 5th of July, 1895, and it would take from a month to six weeks before the larvæ from eggs laid by these reached full growth, which would occur about the same time as the ripening of the wheat, when naturally the straws would dry up and become unfit for food.

Several European writers have treated of this insect and its habits. Probably the best known account is that of John Curtis in his celebrated work *Farm Insects* (1860). This account includes the observations of Herpin and other French authors. The most complete study of the insect is that by Prof. Comstock presented in the bulletin above referred to.

A summary of the life history of the Wheat-stem Saw-fly is as follows:—

The eggs are laid inside the wheat stem just before the ears appear above the sheath, being inserted into the hollow of the stem through a minute hole cut by the female with its saw-like ovipositor. The egg hatches in a few days, and the young larva grows rapidly and attains full growth before the straw ripens and hardens, by which time it will have eaten its way from the topmost joint of the stem to the lowest, feeding chiefly on the substance of the knots, but also on the inside tissues of the straw. About the time the grain ripens, it descends to the bottom joint, and, just above the surface of the ground, gnaws away the inside substance of the straw so as to cut a ring almost, but not quite, through to the outside. (Fig. 2.) This is to enable the perfect fly to emerge easily in spring. It then spins a thin, delicate cocoon; and, like the larvæ of most saw-flies, remains torpid until the following spring, when it turns to a pupa only a few days before transforming into the perfect fly. The date of appearance of the perfect insect evidently varies with the season and locality. The adult is a shining black four-winged fly, banded and spotted with yellow, with the abdomen slightly compressed. The head is large, with prominent eyes, and there are also three ocelli or minute simple eyes near the summit of the head. The antennæ are slightly club-shaped and composed of about twenty segments. The female is rather larger than the male and less ornamented with yellow. The average length is about one-third of an inch (male, 8 mm.; female, 10 mm.). This insect is interesting scientifically, as it must be classified between the true Saw-flies (*Tenthredinidæ*) and the Horn-tails (*Uroceridæ*), so-called from the fact that the larvæ bear a sharp horn-like appendage at the end of the body.

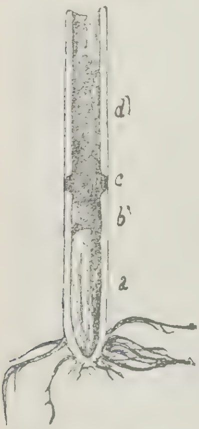


Fig. 2.—Base of straw infested by Wheat Saw-fly: *a*, cocoon; *b*, plug of borings; *c*, circular cut; *d*, scattered borings. (Figure kindly lent by Prof. J. H. Comstock.)

It is evident from an examination of the different stages, that it is more nearly related to the Horn-tails. The Wheat-stem Saw-fly is a native of most of the countries of Europe, and in some years, particularly in France, it has been the cause of much loss. Miss Eleanor A. Ormerod speaks of it in many of her invaluable reports, and shows that while it occurs in noticeable numbers every year, it is only occasionally a serious enemy to the wheat grower.

The question of the introduction of this European insect into America is one of some interest to entomologists, and it seems difficult to understand how it could have taken place. It has been suggested, however, by Prof. Comstock, who found a few cocoons in the straw above the point where it would have been cut by a reaper, that "a small proportion of the insects are probably removed from the wheat fields in the straw and, consequently, there is danger of the spreading of the species in this way. It is probable that the insect was introduced into this country in straw used in packing, and it may be further distributed here in the same way." (*Bull. No. 11*, p. 141).

It is, of course, possible that the insect may have been introduced in this way and although recorded only from the above mentioned widely separated localities, from the inconspicuous nature of the injury, it is extremely likely that it has been overlooked in many places where it occurs. It has not yet been found feeding in any other member of the grass family than wheat and rye. With regard to its occurrence at Ithaca, N.Y., Mr. Slingerland writes under date 28th December, 1896:—"*Cephus pygmaeus* has not attracted noticeable attention here in our locality, nor in our State, as far as I know, since Prof. Comstock discussed it in *Bulletin 11.* I do not know that it occurs in any other State, although it is suspected that it occurs in Ohio and West Virginia."

Remedies.—As nearly all the larvæ pass the winter in the base of the straw, it is quite evident that the most practical remedy will be found in treating the stubble, so as to destroy them or the pupæ before the flies emerge. This may be done either by ploughing deeply after harvest, or by burning over, which for another reason also will certainly be a most useful practice in Manitoba, for in that province, on account of the usual plan of growing wheat for several successive seasons on the same land, some bad weeds have increased enormously. The burning over of stubbles in autumn will certainly destroy vast numbers of these and their seeds, as well as at the same time the larvæ of the Wheat-stem Saw-fly. In Manitoba a great deal more straw is produced every year by farmers than they can possibly feed or use otherwise, and as a consequence, as soon as the farmer knows how much he will require, the residue, a large amount, is burnt every spring, simply to get it out of the way. Should the Wheat-stem Saw-fly ever increase sufficiently to affect the yield appreciably, the burning in autumn of the straw not needed would undoubtedly be a wise practice, as it is known that a few of the cocoons, at any rate, are formed in the straw.

THE ARMY-WORM.

(*Leucania unipuncta*, Haw.)

Fig. 3—The Army-worm.

Attack.—Brown, or sometimes blackish, striped caterpillars (Fig. 3), eating the leaves and stripping the stems of grasses and many other low plants. When attacking cereals, frequently cutting off the heads. When full-grown, over an inch and a half in length, and when occurring in large numbers, migrating in bodies from one food patch to another, On reaching full growth, the caterpillars burrow into the ground and turn to light brown chrysalids, from which in about two or three weeks the moths emerge.

These (Fig. 4) are of a warm satiny-brown colour sprinkled with minute black specks, and with a small but distinct white spot in the middle of each upper wing. They are very active. When the wings are closed, the moth measures about an inch in length.

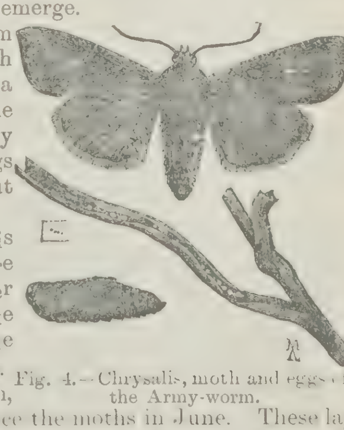


Fig. 4.—Chrysalis, moth and eggs of the Army-worm.

The life history of the Army-worm in Canada is as follows: There are two broods in the year. Eggs are laid in autumn and hatch in ten or twelve days. After feeding for a short time, the small caterpillars, like many of the cutworms, become torpid and pass the winter beneath tufts of grass and other low herbage. In the following spring they complete their growth, feeding on the young grass and grain crops, and produce the moths in June. These lay eggs for the second brood, which is usually much the more numerous and destructive. By the latter part of July, in this part of Canada, the young caterpillars are large enough, when abundant, to attract attention by their depredations. They are full-grown by about the first week in August, when, burrowing an inch or two into the

ground, they change to chrysalids and emerge as perfect moths towards the end of the month.

It has been noticed by many observers that Army-worms are frequently destructive in seasons following years of unusual drought and that they are seldom abundant in the same place for two successive years. In 1895 collectors of insects were struck by the number of Army-worm moths which flew into houses or were seen in several parts of Ontario. From this it was feared that there might be trouble from Army-worms during the present year. This turned out to be the case, for in July and August reports of serious injury were received from almost every part of the province, from Russell county in the extreme east to Essex in the extreme west, and from Welland to Algoma district. The loss was greatest, according to the *Ontario Crop Report* for August 13, 1896, in Essex, Kent, Haldimand, Welland, Lambton, Huron and Wellington. Nor was loss from the Army-worm confined to Canada, but considerable harm was done in some of the Northern United States. In the *Massachusetts Crop Report* for July, 1896, a good article on this subject appears by Mr. A. H. Kirkland, and at the last meeting of the Association of Economic Entomologists held at Buffalo in August, 1896, injuries by Army-worms were mentioned by other entomologists.

The Army-worm feeds, under ordinary conditions, upon various members of the grass family, having apparently a special preference for oats and timothy, but it also occasionally injures seriously rye, barley, wheat and many grasses, as well as, when such food is scarce, pease, beans, lettuce and other vegetables. Mr. Kirkland records that the loss in the Massachusetts cranberry swamps from Army-worms was very considerable this year. He also made some interesting observations on the periods of occurrence of the different broods and found that this year there were three broods in Massachusetts. As stated above, we have only two broods in Canada, but according to Dr. L. O. Howard, there may be as many as five or six broods in the south. In the *Ontario Crop Report* referred to above, is given a long list of extracts from correspondents in all parts of Ontario. The following from some of my correspondents give interesting information on the subject. Those extracts which bear upon the unusual abundance of the moths again this year are of exceptional interest, and in Mr. Metcalfe's experience at Port Hope in catching a large number of the mature moths, we may have the suggestion of a remedy which it would pay to practise on a larger scale when the moths are noticed to be unusually abundant. Of course, when this is the case, not only should the moths be captured as much as possible, but infested lands, whenever possible, should be burnt over in the autumn or early spring and a keen lookout should be kept the following year for the first appearance of the Army-worms, so that the well-known remedies may be applied.

"Marshville, Monk Co., Ont., July 3.—You will find inclosed some most voracious insects which are in my rye in innumerable numbers; they have nearly destroyed it and are now moving on to my corn. What are they? How long will they live? What can be done for them? They seem to have been bred in my fall grain. Are they confined to it? They have eaten the timothy (small) out of my rye, and have left the clover as yet, but I am sure they will eat it when hungry. Please give me as early an answer as possible."—J. E. Reamly.

"Humberstone, Welland Co., Ont., July 9.—I write in relation to a pest which appeared suddenly in this district one week ago, about the 2nd inst., the Army-worm. This place is a village on the Welland Canal, one mile north of Port Colborne and Lake Erie. About a mile below this place, and extending two or three miles, is a tract of low land, the soil being a black loam. It was in this tract of land, on the farm of James Phillips, two miles north of this place, that the Army-worms were first noticed in countless numbers destroying principally oats and corn. In the oats, these worms first take the leaves, then the head, afterwards the stalk. Some farmers are applying Paris green to their corn crop. Is that safe or desirable? What is it advisable to do, in order to prevent their destroying the oat crop? Can anything be done to prevent their entering any field? The worms are of various sizes, from half an inch to one inch and a half in length, and are of a dark colour. All the information the farmers can give in relation to their origin is that on the night of the 1st of July there had been a slight

frost and when they examined their crops the next morning they found countless numbers of these worms in their oats and corn. They come in such numbers that they make a clean sweep of all before them, and unless some way can be found to check their ravages the damage they will do will be exceedingly great. The most of the destruction, so far, has been in the tract of low land referred to. We are anxious to hear from you as soon as possible."—C. E. THOMPSON.

"Diamond, Carleton Co., Ont., December 8.—I received your letter and report *re* the Army-worm, and thank you most sincerely for the promptness with which you answered my inquiries. I followed your directions, rolling and ploughing, and found that it destroyed them greatly. I used a three section roller, and where the ground was level it did good work. Where the surface was rough I ploughed three trenches and in the third I sank holes, as you described, and there did not half a dozen succeed in crossing. It was pasture land, and they were heading for the grain, but never reached it, so that I am unable to say anything with regard to fighting them in the grain. They did considerable damage in some parts of this township, Fitzroy, in the grain."—JOHN GREENE.

"Jermyn, Peterboro' Co., Ont., August 10.—I send some moths which came into our house last night in thousands."—SAMUEL ARMSTRONG.

"Toronto, August 18.—The Army-worm moth (*L. unipuncta*) has been very numerous this fall, literally swarming everywhere during the first three weeks in August."—JAS. H. MCDUNNOUGH.

"Port Hope, Durham Co., Ont., August 11.—Several large honeysuckles are growing in my garden covered with berries which attract hundreds of Army-worm moths at night."—REV. C. J. S. BETHUNE.

"Port Hope, Durham, Co., Ont., Nov. 11.—I have been doing some collecting this fall that may be of economic value, viz., the collecting of over six hundred Army-worm moths, mostly females, at sugar. Would not killing the moths thus attracted be a very effective way of fighting them?

"While collecting larvæ last spring, the Army-worm did not appear as common as usual, and so I was surprised at the large numbers of the moths that were flying about the first week in June. They swarmed on the under side of pine branches and hovered about the bloom of the barberry in small clouds. No armies appeared in my immediate vicinity, the larvæ not being in such numbers as to get ahead of the supply of their natural food. They fed on Quack Grass (*Agropyrum*), Fox-tail (*Setaria*) and Wild Buckwheat. After the pease were pulled, the caterpillars sheltered under the bundles and I had a good opportunity to examine them. The bulk were plentifully dotted with the eggs of a Tachina fly. Those very useful beetles, *Calosoma calidum* and *Harpalus caliginosus*, were busily feasting on them. These beetles were innumerable, and, when the wind changed after a land breeze, would be washed up on the lake shore in bucketfuls.

"About August 10, I commenced sugaring; the bait was smeared on the supports of an open shed facing the north, this, of course, being an unfavourable position, but, notwithstanding, the moths came readily to the sugar. The largest catch was made on the evening of August 17, when I took over a hundred before nine o'clock. Over six hundred were taken before August 25. The mixture used was made by dissolving sugar in hot water and adding enough rum to give an attractive odour."

"Port Hope, Ont., Dec. 1.—Many of our common beetles are washed up in great numbers on the shores of the lake here, at Toronto and at Grimsby, as well as members of the other orders. After a north wind of one or two days' duration the wind usually shifts till it blows from a southerly direction, and then is the time for a harvest of beetles on the lake shore here. While at Grimsby (on the other side of the lake) in the summer of 1894, on only two or three occasions did the wind blow on shore, the balance of the time it blew almost continuously from the south. I found many good things on the rare occasions of a north wind."—W. METCALFE.

Remedies.—Under this head I have nothing to add to what appeared in my annual report for 1894 as follows:—

"Although only occurring occasionally in excessive numbers, and then in but few localities, this moth is very widely distributed in Canada, and may generally be found

in most parts in low lands where the caterpillars have suitable conditions for growth and an abundance of food. It has also been observed that the Army-worm is most abundant in wet seasons following a dry autumn, the damp weather giving them the same conditions over a large area as they would find in their own special habitat, viz., low, swampy, and grassy places.

"When the caterpillars appear only in moderate numbers, they have an abundant food supply, and do not then acquire the habit of 'marching,' which is merely moving from one place where all the food has been devoured, to a fresh pasture. When, however, their occurrence is excessive, they must of necessity move on to some other place or starve. They may be prevented from marching from one field to another by ploughing a deep furrow across their path. This should be cleared out so as to leave the edge nearest to the field to be protected, perpendicular or slightly overhanging. Along the trench so formed, pits must be dug about 12 feet apart. When the caterpillars come to the trench, they are unable to climb up the opposite side, and after a few trials, walk along until they fall into the pits, when they may be destroyed by covering them with earth and tramping it down, or, as Prof. Lugger, of Minnesota, suggests, 'with a liberal dose of kerosene oil and water. Even a shallow ditch will answer this purpose if the earth is made friable enough to keep the worms from ascending. If a log is dragged continually through such a ditch, nearly all the worms collected there are either killed or maimed.'

"If pits are not dug, when the caterpillars occur in large numbers, the trench will soon be filled, and they will walk over on the bodies of their fellows. In case any of the worms succeed in crossing the ditch, a narrow strip of the plants on the opposite side of the trench should be dusted or sprinkled with a strong mixture of Paris green diluted either with 25 times its weight of flour, ashes or land plaster, or mixed with water as strong as one ounce to a pailful of water.

"When an attack has been very severe in any locality, much good may be done by burning the old grass and stubble in autumn or spring; in this way, many of the young larvæ are destroyed, as well as the old stems, which it seems are the favourite place for the spring brood of moths to lay their eggs upon.

"An encouraging feature in connection with an invasion by the Army-worm, is the fact that it is extremely rare for the insects to appear in large numbers two years running in the same place. This is due to the fact that they are almost invariably attended by parasitic foes, which destroy them so effectually that the occurrence of two consecutive 'Army-worm years' in the same locality is almost unknown."

FODDER CROPS.

The injuries to fodder crops during the summer of 1896 were chiefly by the Army-worm and Grasshoppers. Occasional mention was made of the work of the Clover Seed Midge, which, however, is found to be far wider-spread over the Dominion than is indicated by reports, because this insect is mentioned only by correspondents in the seed-growing districts. Undoubtedly much clover was killed out by the droughts of 1895 and 1896 and by the severe cold of December, 1895, and January, 1896, which came when there was no snow on the ground. The work of the Clover-root Borer (*Hylesinus trifolii*, Miller) was reported by Mr. R. A. Harvey, of Laskay, York Co., Ont.

WHITE GRUBS, the larvæ of the different species of June beetles (*Lachnosterna*), have been reported as injuring meadow lands and lawns. The good work of robins and high-holders (golden-winged woodpeckers) in destroying the grubs on an infested lawn is mentioned by Mr. J. F. McDonald, barrister, of Dunnville, Ont. Another instance involving considerable injury was on the land of Mr. Caius M. C. Hubble, of Sand Hill, Ont., who writes:—"I dug up these grubs all the season among potatoes, carrots, corn and turnips; but they are most numerous in the carrots. The last I found was on November

6. They were in the same condition as those I dug up in the summer. There are a number of tall poplars bordering my garden which, no doubt, were the cause of my having such a number of these grubs. For a piece of ground adjoining mine, where there are only three or four apple trees near it, had very few. About one-tenth of my ground where I had white carrots was badly infested, but I found them scattered among other crops. It is a very unusual occurrence for them to be so abundant here."

COTTONY GRASS-SCALE (*Eriopeltis festucæ*, Fonsc.).—There has been little reference during the past summer to this insect, treated of in my last report. Mr. D. G. Crawford, of Sydney Mines, C.B., N.S., says:—"I noted that the egg-sacs began to be formed about 21st July, and they were not nearly so numerous as last year, but appeared in other localities to a limited extent. I believe they will disappear in a year or two."

GRASSHOPPERS.—The three species of grasshoppers which have this year committed depredations on fodder and grain crops throughout the Dominion, are the same as were injurious last year, namely, the Common Red-legged Locust (*Melanoplus femur-rubrum*, DeG.), the Lesser Migratory Locust (*M. atlanis*, Riley) and the Two-striped Locust (*M. bivittatus*, Say). These were reported as very abundant in some parts of Ontario and Quebec early in the season. In the *Ontario Crop Report* for August 13th, there is frequent mention of their attacks upon spring and fall wheat, barley, corn, pastures, and even on hops.

Fig. 5.—A Locust.

Locusts are generally spoken of by correspondents as Grasshoppers, and I cannot see the least objection to using the words "Grasshopper" and "Locust" indiscriminately, for although entomologists claim that the word "Locust" is the more accurate name for those species with short antennæ (the Acridiidæ), the name "Grasshopper" is so universally used and understood for these insects by the public in general that it is certainly wise to recognize this word, at any rate, in these reports prepared especially for farmers or those who, with very few exceptions, are not entomologists. Particularly is this the case as it seems difficult to understand why the word "Grasshopper" should be restricted to the Locustidæ, or long-horned grasshoppers, while the word "Locust," which we might naturally suppose would most aptly apply to the Locustidæ, should be considered the accurate popular name for the Acridiidæ, or short-horned species. Possibly, it may have been because the plague of locusts mentioned in the Bible was known to have consisted of a short-horned species, and the application of the word for that reason has become so well known as applied to those forms with short antennæ that, to some, it has seemed unwise to change it.

The correspondence during the past season, concerning grasshoppers, their injuries and their enemies, is too extensive for us to give more than a few extracts.

"St. Lin, L'Assomption Co., Que., June 7.—Please tell me the best and most economical plan for destroying grasshoppers. They threaten to destroy the whole crop."—J. P. ARCHAMBAULT, *Secretary of Agricultural Circle.*

"Mastai, Quebec Co., Que., August 19.—Grasshoppers eating up cabbages."—H. F. HUNT.

"Port Elgin, Bruce Co., Ont., June 16.—During the past few weeks there has been a plague of grasshoppers in this vicinity. They follow the roadsides, eating the grass so closely that it has the appearance of being singed by fire. At intervals they enter the fields, starting at one point and sweep everything clean before them, such as oats, hay and pasture,—pease, so far, being the only exception. In the evening they gather in countless numbers on the fences of the field they intend to devour, and actually eat into the rail-posts and boards, staying there until the warmth of the day comes, when they again begin their work of destruction. Is there a remedy to stop this fearful plague and save the crops? Could they be scattered when they commence their inroads on a field, or destroyed on the fences at night?"

"June 26.—Fields have been destroyed by grasshoppers. Pastures are singed as if by fire, and the cutting of oats and fall wheat in the green state has begun in some places. A small red insect is to be found under their wings, which is destroying some

of them, but there are many young hoppers coming in their place. If the present state of things continues much longer, there will be very little of anything left. I fear it is now almost too late to try the hopper-dozer, as the grasshoppers can fly well. Of all the pests this is the worst we have ever seen."—A. BEATON.

"Ashgrove, Halton Co., Ont., Sept. 14.—Grasshoppers this year were very numerous in some sections, but were not so general over the country as I have seen them. In some parts that were stony they appeared at one time as if they would take everything. They were particularly destructive on grass, spring wheat, oats and turnips."—GEORGE HARDY.

"Osnabruck Centre, Stormont Co., Ont., Nov. 23.—The worst pests we had to contend with in this section were grasshoppers and Colorado Potato-beetles. With regard to the grasshoppers, they were very bad for a while, but disappeared from this part, as far as I can remember, about August 1st. They were particularly destructive to grain fields adjoining pastures or grass lands."—A. S. HODGINS.

Remedy.—When locusts appear in enormous numbers, they frequently become a serious scourge to the agriculturist. The most efficient remedial measure which can be adopted is the use of the hopper-dozer, which has been described in previous reports. In the case of restricted swarms, much good may be done by the use of poisonous mixtures. As an instance, I cite the following experience :—

"Princeton, Brant Co., Ont., June 23.—I am trying to get rid of the locusts by mixing bran, Paris green and molasses together and putting it in heaps in different parts of a field. Can you recommend any better way of exterminating them? They are doing considerable damage to my crops already.

"July 7.—As to the result of the mixture I used, viz., bran, Paris green and molasses, I applied it in a similar way to that in which the mixture you mentioned in your letter was applied. I put it around six acres of beans which the locusts were destroying as fast as they could. In the next field I had another six acres of beans which were sown a week later. After putting the mixture on the first field the locusts did no further damage to that piece, but started at the beans in the next field. Noticing this, I put the mixture round the second field and they did no further damage to either piece afterwards. I noticed several dead around the heaps and suppose several hopped away to the fences and died there. Whether the poison stopped them eating the beans or whether the beans got too tough for them, I cannot say. Only, I am quite sure they did not bother either lot after it was applied. Alongside of the first lot of beans I had nearly five acres of potatoes just coming out in flower. There we put Paris green on for the potato bug, a few days after putting the poison on the second lot of beans. We then noticed that the locusts were cutting the potato stems off. Some of the stems cut I noticed were a foot in length. When walking through the patch lately I saw hundreds of locusts lying dead. The Paris green was applied to the potatoes mixed with land plaster. At the present time there are millions of grasshoppers or locusts on my farm, and they are doing an enormous amount of damage to my oats. I am afraid it is too late to stop them, although I intend to scatter the poisonous mixture about the fields. My opinion, so far, is that the mixture should be put on, especially on grass land, early in the season before the locusts get their wings and before there is much for them to eat, and continue to apply it at certain intervals."—J. E. RICHARDSON.

From the answers received to the questions sent out by Prof. Panton, grasshoppers were rated as second in the amount of injury caused by insects in Ontario during the past year. There is no doubt but that early in the season there was a considerable amount of damage done by locusts; nevertheless, one of the remarkable occurrences of the year was certainly the widespread and sudden diminution in the numbers of these insects, beginning about the 1st of August.

A curious fact affecting the sudden disappearance of locusts in August last was brought to my notice by Mrs. J. Cunningham Stewart, of Ottawa, who, when travelling on Lake Huron, saw large numbers of grasshoppers floating in the lake. Mrs. Stewart also kindly referred me to Mr. Wm. Lockerbie, engineer of the Canadian Pacific Railway Co.'s steamship "Athabasca," who had observed them on a previous trip. Mr. Lockerbie writes: "As to how numerous these insects were, I can only say they were

collected in patches that would probably cover half an acre or perhaps more, and there seemed to be a very great number of these patches, so much so that when the wind blew off the bay (Georgian Bay), they would float up the Owen Sound River and collect in any shelter that was open." Mr. Lockerbie suggests that they may have been blown off the shore by a high wind.

Judging from a great many letters of correspondents, as well as my own observations, I feel sure that the sudden disappearance of locusts over large districts in Canada was due almost entirely to four kinds of well known parasites—a fungus, intestinal worms, the maggots of two or more species of flies and the locust mite. All of these active friends are well known to entomologists and have been frequently observed before, but, as there has been so much interest evinced in the subject, I give herewith a short account of each, which I feel sure will be acceptable to many.

Grasshopper Parasites.

Fungous Disease of Grasshoppers.—A most potent ally in the destruction of locusts when they exceed their normal numbers is a parasitic fungus known by the name of *Empusa grylli* (Fresenius) Nowakowski. This produces a very infectious disease, the effects of which are frequently observed, but the cause of which is seldom recognized. Diseased locusts were received from Princeton and several other places in Ontario. The disease seems, too, to have been very virulent near Montreal. Mr. T. A. Crane writes from that place, under date of 1st August: "A few days ago the grasshoppers were vigorously attacking my oats. Last evening, when I examined them again, I noticed that they were clinging fast to the tops of the stalks, but they were all dead. Some were minus their heads and some minus their entrails." This describes well the appearance of locusts which have succumbed to this disease.

During the month of August, and later, it was a common thing to see around Ottawa and in almost all other places visited, numbers of different species of locusts, but particularly the Two-striped Locust, hanging motionless, generally near the tips of stems of grasses and other plants. (Fig. 6.) Upon examining these, they were found to be dead and the bodies frequently dried up, brittle and containing a powdery material. This powder is in reality the spores of a parasitic fungus very nearly allied to the well-known and frequently observed *Empusa muscæ*, which every year destroys so many house flies, leaving them dead on windows, curtains, plants, &c., with a cloud-like deposit of the spores of the fungus around them. Under certain conditions, probably much affected by weather—warm, foggy weather being considered favourable—the disease of grasshoppers above mentioned frequently becomes a most fatal epidemic. Each of the mummified bodies is a centre of infection containing myriads of spores, each one of which, blown away by wind or washed down by rain, if it fall upon a locust in a suitable condition, is capable of causing death. This useful parasite, which does such efficient service, had attention first drawn to it by Prof. Herbert Osborn in Iowa, who published his observations, with Prof. Bessey's original description, in *Bulletin No. 2*, Iowa Agr. Coll., 1884, under the name of *Entomophthora calopteni.* The accompanying original illustration, kindly loaned by Prof. Otto Lugger, of the University of Minnesota, shows admirably the attitude of a Two-striped Locust killed by the fungus.

Fig. 6.—Two-striped Locust killed by fungus. (O. Lugger.)

The Tachina Flies.—Mr. J. E. Richardson, of Princeton, Ont., who, I find from several letters received on this subject, is a close and accurate observer, writes:—

"July 7.—I have of late noticed, more especially the other day after a rain, flies attacking the locusts. About half a dozen would fly after one, and as soon as it settled down they would alight upon it."

Prof. Riley graphically describes what this meant, in the *First Report* of the United States Entomological Commission on the Rocky Mountain Locust, page 319: "The most common of the parasites which prey on the locusts internally are the larvæ of certain flies belonging to the genus *Tachina*, gray-coloured, two-winged flies having very much the general appearance of house-flies.

"These Tachina-flies firmly fasten their eggs—which are oval, white, and opaque, and quite tough—to those parts of the body not easily reached by the jaws and legs of their victims, and thus prevent the eggs from being detached. The slow-flying locusts are attacked while flying, and it is quite amusing to watch the frantic efforts which one of them, haunted by a Tachina-fly, will make to evade its enemy. The fly buzzes around, waiting her opportunity, and, when the locust jumps or flies, darts at it and attempts to attach her egg under the wing or on the neck. The attempt frequently fails, but she perseveres until she usually accomplishes her object. With those locusts which fly readily, she has even greater difficulty; but though the locust tacks suddenly in all directions in its efforts to avoid her, she circles close around it and generally succeeds in accomplishing her purpose, either while the locust is yet on the wing, or, more often, just as it alights from a flight or a hop. The young maggots hatching from these eggs eat into the body of the locust, and after rioting on the fatty parts of the body—leaving the more vital parts untouched—they issue and burrow in the ground, where they contract to brown, egg-like puparia, from which the fly issues either the same season or not till the following spring. A locust infested with this parasite is more languid than it otherwise would be; yet it seldom dies till the maggots have left. Often, in pulling off the wings of such as were hopping about, the bodies have presented the appearance of a mere shell filled with maggots; and so efficient is this parasite that the ground in parts of the Western States is often covered with the Rocky Mountain Locusts dead and dying from this cause."

There are several species of these Tachina-flies, and we have bred two kinds during the past summer, one from specimens sent by Mr. Richardson, and another much larger species, *Exorista flavicauda*, Riley (Fig. 7.), from several localities. This last named species is of great interest from the fact that it is the enemy of the Army-worm, which, above all others, brings down the numbers of that plague when it increases unduly. There are also, in addition, parasitic species of flesh-flies (*Sarcophaga*) which resemble the above very closely, but may be distinguished by their antennæ being hairy instead of smooth.

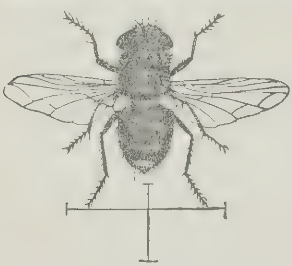


Fig. 7.—Tachina-fly.

Hair-worms.—Hair-worms, or Hair-snakes, as they are sometimes called, are objects of great curiosity, not only to those who know nothing of their habits, but also to all who have studied their remarkable life history. Their great abundance in some places during the past summer has been remarked by many correspondents, and the good work they have done as parasitic enemies of many kinds of grasshoppers, crickets and other injurious insects, renders it advisable to give a short outline of what is known about them. There are many misapprehensions as to the true nature of these creatures, notably the erroneous ideas that they are related to the true snakes or that they are horse-hairs which by some mysterious process have become capable of living and moving. Snakes, however, belong to the much more highly organized Vertebrates, or animals with backbones, while the Hair-worms are members of the Entozoa, or intestinal worms, a section of the Articulates which have their bodies merely divided into joints. The supposition that a horse-hair or any other dead organic matter can ever become a living creature, is too absurd to need more than mention.

Fig. 8.—Egg of *Gordius* containing a fully developed embryo,—highly magnified. (After Leidy.)

It must be acknowledged that there are some gaps in our knowledge of the life history of Hair-worms concerning which it seems impossible to make any suggestion. It is known positively that the eggs (Fig. 8.) are laid in water and that the young worms begin their lives as free-moving animals, which have been actually seen to

penetrate through the delicate skin at the joints of the legs of aquatic insects and live for some time inclosed within a cell inside the bodies of these. The next stage is as parasites in fish, the food of which consists largely of aquatic insects. When the latter containing young Hair-worms are eaten, the cells are broken or dissolved by the process of digestion and the young worms at once work their way, by means of special hooks around the head (Fig. 9.), into the stomach of the fish, where they again become encysted in the mucous layer. After a time they bore through their cells and are passed out from the fish's stomach into the water. Subsequent to this, nothing is known, until they are found as parasites inside insects of various orders, and it is difficult to conceive how it is possible for these worms to enter the bodies of such active insects as locusts and crickets, which also, besides, live mostly in dry places. It is true, though, as has been pointed out, that ground beetles, spiders and locusts which live in low, moist places are most infested. Certain it is, however, that Hair-worms are parasites inside the bodies of many insects, and that specimens have been seen to lay eggs from which young emerged which passed through the stages described above. These worms are of two kinds, which, when only examined superficially, differ chiefly in colour: dark ones, from 6 inches to a foot in length and with a diameter not reaching at the thickest part one twenty-fifth of an inch, belonging to the genus *Gordius*, with the above life history; and others, white in colour, much longer and slenderer, belonging to the genus *Mermis*, which, although similar in their parasitic habits to the *Gordius* worms, have a quite different mode of development, as well as a different internal structure. Both kinds of these parasitic worms are frequently found associated within the body of the same host. The eggs of *Mermis* are laid in the ground and the young on hatching resemble their parents in form. On emerging from the egg they make their way to the surface of the ground and enter at once on their parasitic life in some insect. They acquire full growth inside their host and then bore out through the skin and bury themselves in the ground. It is not until this period in their lives that the genital organs develop. They pass the winter in the ground at varying depths, and eggs are laid in the spring. I received from Mr. T. Pearson, of Knowlton, Que., gardener to the Hon. Sydney Fisher, a large specimen 17 inches in length, which he had found in December under a stone six inches beneath the surface of the ground.

Fig. 9.—Young Hair-worms after escaping from the egg, highly magnified, showing the circles of hooklets (*p*) drawn in, and (*q*) partially and (*r*) wholly protruded.

As stated above, these parasitic worms infest insects of various orders. Mr. W. Hague Harrington, of Ottawa, writes to me:—"I have frequently obtained *Gordius* from locusts, and on one occasion I obtained two small specimens of *Mermis* from a lady-bird *(Hippodamia 13-punctata)*.

In the *First Report* of the United States Entomological Commission is a full account by Prof. Riley of almost all that has been found out concerning these strange creatures. I quote the following:—

"These Hair-worms are not only very frequently found in different locusts, but Prof. Leidy even has one from a cockroach. They likewise occur in many other insects and small animals, as beetles, moths and butterflies, bees, two-winged flies, spiders and snails. As a rule, the worms forsake Lepidoptera while these are in the larva state or more rarely in the pupa state, whereas they generally issue from Coleoptera and Orthoptera only after these have acquired the perfect state."

While they are inside the bodies of their hosts, Hair-worms are folded and coiled up so as to occupy a surprisingly small space. When seen, as is frequently the case, on the ground, they move in a snake-like manner, sometimes with a part of the body raised up and swaying from side to side. When in the water, they are either knotted together and tangled like a piece of black cotton or swimming with an undulated motion close to the surface of the water.

When referred to in correspondence, it is seldom that species of *Gordius* and *Mermis* are separated, though they are frequently mentioned. In no year do I remember so many inquiries to have been made as during the past summer, which, of course, was due

to their unusual numbers. Mr. J. H. Vivian, of Toronto, reports a remarkable occurrence of Hair-worms in Toronto, as follows:—"October 14.—On the occasion when I first saw them there were millions of them both white and dark-coloured. I have a large garden, and it was almost impossible to find a space of two inches between the spots occupied by these worms. A very heavy rain fell on the night preceding. The special peculiarity about them to me was their snake-like movements; standing almost on their tails, they swayed the upper two inches of the body in the air."

During the past autumn they were very abundant, as could frequently be seen on sidewalks where crickets and grasshoppers had been crushed. Sometimes as many as five specimens were found inside a single host. There is no doubt that these parasites materially affect the increase of the insects which they infest, but the statement that grasshoppers so infested never lay eggs is not always at any rate correct. In October last I found a female of the Two-striped Locust which had been trodden upon while laying her eggs between two boards of the sidewalk; upon pulling her abdomen from between the boards, I found she had laid five or six eggs and the abdomen contained several more ready to be laid, and also one specimen of *Gordius* and two of *Mermis*.

The Locust Mite.—The parasite of grasshoppers which has probably been most frequently noticed and which has been very widespread during the past summer, is the small red mite, *Trombidium locustarum*, Riley, which, in its larval form, is often a conspicuous object on the bodies of grasshoppers. The larvæ are small, bright red, bag-like, six-legged mites (Fig. 10*a*.), most frequently found attached,

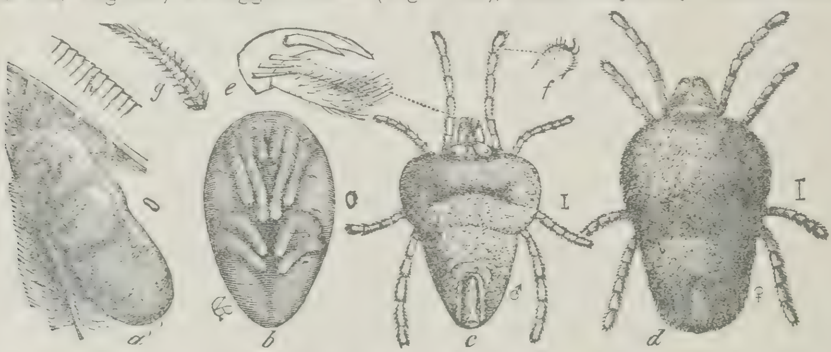


Fig. 10.—Locust Mite: *a*, mature larva when about to leave the wing of a locust; *b*, pupa; *c*, male adult when just from the pupa; *d*, female—the natural size indicated to the right; *e*, palpal claw and thumb; *f*, pedal claws; *g*, one of the barbed hairs; *h*, the striations on the larval skin. (After Riley.)

in varying numbers, on or near the base of the wings of the perfect grasshoppers, but also sometimes abundant on the pupæ. When full-grown, these are about one-twentieth of an inch in length and about half as wide. The life history of these useful allies, which, although so small, destroy many injurious locusts, has been worked out fully by Dr. Riley. The eggs are laid in spring in clusters of between 300 and 400, an inch or two beneath the surface of the ground. From these eggs hatch little orange red mites (Fig. 11*b*.), which, being very small, crawl out easily between the particles of the soil and fasten themselves to their future hosts, generally selecting a spot near the base of the wings from which they

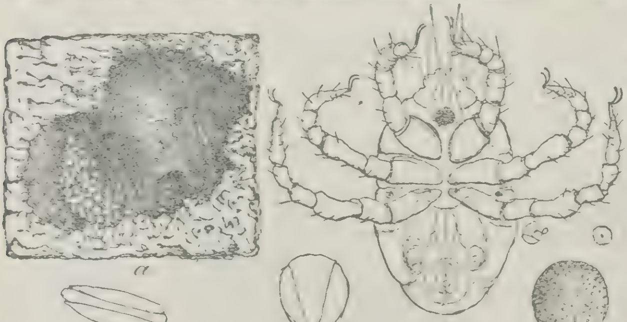


Fig. 11.—Locust Mite: *a*, female with her batch of eggs (after Emerson); *b*, newly hatched larva—natural size indicated by the dot within the circle; *c*, egg; *d*, *e*, vacated egg-shells. (After Riley.)

cannot be dislodged. Sinking their minute jaws into the tissues of the body of their veitim, they remain firmly attached, sucking its blood and living entirely at its expense, until the full larval growth is reached. Dr. Riley thinks that the full period of development of the larvæ, after attachment, seldom exceeds a fortnight. When distended with food, these mites are so swollen that their short legs are almost invisible, and many people who notice them mistake them for the eggs of some parasite. When examined closely, however, their legs can be seen and are found to be six in number, which is now known to be one of the characters of the larvæ of the genus of mites called *Trombidium*. As soon as the larvæ are full-fed, they let go their hold of their hosts and fall to the ground, where, under some temporary shelter, they gradually change to pupæ inside the larval skin. Finally, both the old larval skin and the new one inside it, which incased the pupa, burst, and the perfect form, an eight-legged mite, emerges. These are common objects in the country, drawing the attention even of people who do not study insects, by the intensity of their velvety scarlet colour. They pass the winter in the perfect state, and are frequently conspicuous on the ground in early spring before vegetation has made much growth. Not only is this insect useful in the larval form, when it preys upon locusts, but also in the perfect state it does good service by seeking out and devouring their eggs.

I give below a few extracts from letters of correspondents who have noticed these mites :—

"Craighurst, Simcoe Co., Ont., Dec. 19.—We had this year the same experience with grasshoppers as you mention. They hatched out in immense numbers, and at one time we were afraid they would do great damage, but they seemed to disappear early in August or the latter part of July. The parasite that lays its eggs on their backs under the wings was abundant. Most specimens examined showed their presence."—G. C. CASTON.

"Princeton, Brant Co., Ont., June 23.—On examining some locusts or grasshoppers, I find on the underside of the wings some minute insects—I suppose, parasites. They are now on nearly all the locusts I have looked at. The majority are about [illegible] of an inch in length, but many much smaller, of a bright red colour."—J. E. RICHARDSON.

"Doe Lake, Muskoka, Ont., August 18.—Grasshoppers damaged both grass and grain. They have done much harm on light sandy soil ; there are many of the red eggs under the wings. Are they parasites?"—F. C. JUDD.

"Omemee, Victoria Co., Ont., Aug. 3.—I send you a common grasshopper, with red insects on it. They appear to be very numerous this year, but I fear came too late to prevent the grasshoppers doing harm."—E. S. MORGAN.

"Louise, Grey Co., Ont., September 26.—Grasshoppers came along about the 1st of June in massive flocks and destroyed nearly all the hay. They were by far worst on spring wheat and barley ; in fact, there was hardly any of either grain in this part. Oats turned out about 10 to 12 bushels per acre. Pease were a fair crop. The hoppers all disappeared about the 1st of August."—GEORGE LAST.

"London, Middlesex Co., Ont., December 7.—I never saw grasshoppers worse than in a part of McGillivray about the middle of June, but within two or three miles on each side they were scarce. Where they were very numerous, I found none of the locust mites ; where scarce, almost every one was infested."—J. DEARNESS.

THE GRAY BLISTER BEETLE.

No account of the common parasitic enemies of grasshoppers would be complete without some mention of the Blister Beetles, which in their larval stage prey upon the eggs. During the past summer, as is usually the case in years following excessive locust presence, Blister Beetles have done considerable damage to potato and bean crops and several kinds of garden plants.

"Grenville, Argenteuil Co., Que., June 11.—I send by mail specimens of a new (to me) potato pest. On a potato patch 20 feet by 40 feet there were many thousands of them. I was through the patch two days ago, and there was no appearance of anything unusual. Now the plants on which they are feeding are almost leafless."—ROBERT HAMILTON.

"Staynerville, Argenteuil Co., Que., June 18. I have a field of horse beans which came up and are growing nicely, but during the last two or three days a kind of bluish fly is stripping off every leaf."—WM. NICHOLS.

"Chêneville, Labelle Co., Que., June 16.—I send you some insects which are in very large numbers on my potatoes, eating the leaves rapidly. I have sprayed the plants with a mixture of 1 pound of Paris green in 200 gallons and the insects are already disappearing."—H. LEFEBVRE.

Specimens were also sent from Mr. L. Lepage, from Minerve in the same county.

"Port Arthur, Ont., June 23.—I mail you herewith insects captured on a potato patch near Port Arthur, wherein they were stripping the vines of their leaves. These are apparently a far worse destroyer than the Colorado Potato-beetle. This is the first time an enemy of the leaf of the potato has appeared in this district."—JOSEPH G. KING.

"Montreal, Que., June 25.—I send you beetles which did a little harm on my farm last year, and this year they have done a good deal. Their preference seems to be for tender, delicate foliage, but when this is not handy they take what they can get. They began with *Caragana gracilis*, *Aralia spinosa* and *Clematis flammula*, and ended with potatoes and tomatoes. They come in hundreds and make a clean sweep of any branch they attack."—THOS. A. CRANE.

"Montreal, Que., June 24.—I send specimens of a beetle which attacks the Windsor Broad Beans. We have grown these beans for three years at Lachine. The first year they produced well, the next year this beetle pest appeared in swarms and ravaged them severely. Tired of picking them off, we tried a weak mixture of Paris green, with flour or water, I forget which, but it killed the crop and we did not have a dressing. This year we have more beans growing than usual, but they have been attacked incessantly by the pest which is a voracious eater. A neighbour not knowing our experience tried Paris green and killed his plants. We have been picking and knocking the pests off into a mixture of coal oil and water in a broad, shallow vessel, which seems to kill them. Last year a small cloud of them settled down on the potato vines and ate to some extent, but did no damage. This year they have left the potatoes alone for the beans. They do not breed in our place, but settle down in small swarms, full-sized, and it seems to us that nothing but a strong mixture, dangerous to the plant, would kill them, but perhaps you can tell us a remedy. It is necessary to pick them off at least once a day (earlier in the season, perhaps oftener), but they are not diminishing much. The labour is so tiresome that we shall be little disposed to grow our favourite bean another year, and others no doubt feel the same."—A. H. CHAMBERS.

"Previck Hall, Port Arthur, Algoma, Ont., Sept. 5.—In July my horse beans were infested with black beetles which I have sometimes seen on potatoes. I do not think they have podded quite so well. I did not dare to use poison for the beetles, as it would have spoiled the fodder. I killed as many as possible by hand, but they stripped many stalks of the leaves."—WILLIAM WILSON.

"Petitcodiac, Westmoreland Co., N.B., Dec. 9.—The black blister beetles were on my horse beans in about the same numbers as last year."—D. SINCLAIR SMITH.

All the specimens sent in this year were the gray blister beetle (*Macrobasis unicolor*, Kirby). Here on the Experimental Farm the same species was abundant and troublesome on Caragana hedges, some other leguminous shrubs in the botanic garden and *Aralia chinensis*, L. Although the attack is severe while it lasts, the period during which blister beetles injure vegetation is not of long duration. Moreover, these insects do not appear in injurious numbers every year. They are seldom noticed except in seasons following those when locusts of different kinds have been unusually abundant, a fact which is easily understood when we remember that the larvæ feed upon the eggs of locusts. For the same reason we may confidently hope that next year we shall have little complaint of the ravages of blister beetles on beans and other crops, owing to the marked diminution in the numbers of grasshoppers after the 1st of August last. In localities liable to be visited by blister beetles a sharp watch should be kept for their appearance during July, and as soon as they are seen efforts should be made to fight them, either by sweeping the crops with a net mounted on a handle or by beating them into a pan containing some

water, with a little coal oil on the top. When the area attacked is too large for this, spraying promptly with Paris green, one pound to 100 gallons of water, or dusting with one pound of Paris green to 50 of flour, would destroy them.

Referring to Mr. A. H. Chambers's experience above mentioned, I think there must have been some other cause than the Paris green which destroyed his crop, for a very much stronger mixture than he mentions has been used by some of my correspondents and by myself without injury on the same crop.

Locusts on Sable Island.

In my reports for 1894 and 1895 I have referred to serious injury by locusts on Sable Island, off the coast of Nova Scotia. This was so severe last year that it was necessary to purchase 50 tons of hay to keep the horses and stock through the winter. During the past summer the loss has been far less. The Superintendent of the island writes: "September 7.—In a few days we shall have finished harvesting the hay crop, which this season is large, owing to the unusual continuous fogs and heavy rains from June till the middle of August. The locusts have done but little damage, although plentiful. Vegetation nearly everywhere kept ahead of them." In an earlier letter dated the 12th of June, the Superintendent expressed the opinion that hopper-dozers could not be used satisfactorily on Sable Island, owing to the uneven surface and loose sand in places. He invested in turkeys and raised a large number of chickens, which doubtless were useful in destroying many locusts. The young locusts first appeared at No. 4 Station about the 24th of May, but none appeared at Main Station until the 12th of June.

ROOT CROPS AND VEGETABLES.

Few complaints of injuries by insects to root crops during the past season have been received. There were, of course, the usual applications for remedies against the TURNIP FLEA-BEETLE (*Phyllotreta vittata*, Fab.) from all parts of the Dominion, but the loss was not extensive. The best remedy—dusting the young plants as soon as they appear with land plaster and Paris green (50 to 1)—is now well known. During June this insect, both in the mature and larval forms, was troublesome in gardens at Ottawa upon cress, particularly the curled varieties. When the plants were young, a mixture of Paris green and flour was used successfully; but later, when the crop was ready for the table, dusting with powdered tobacco waste was substituted, and the cress was kept closely picked. The larvæ, which are slender, dark brown grubs, dotted with black, are from one-eighth to three-sixteenths of an inch long, and for the most part mine inside the tissues of the leaves, but frequently, when nearly full grown, burrow out through the thin epidermis and feed for a time on the surface. I have been unable to find these feeding, either on or in the roots. When full-fed they enter the ground, sometimes to a depth of three inches, and emerge nearly three weeks later as the well known perfect flea beetles, which are about one-eighth of an inch long, with two wide waved yellow stripes down the back. As a rule, the larvæ are not often noticed, because by the middle of June the demand for garden cress as a salad or table relish has ceased, owing to the abundance of radishes and similar vegetables. Injury to the leaves at this time is, therefore, of small importance, as the larvæ are never abundant enough to affect the formation of seeds on such plants as are left for that purpose. When green leaves are required, the best method is to encourage a quick growth by watering frequently and cutting as soon as the leaves are fit for use. A weak solution of nitrate of soda (one ounce in three gallons of water) applied carefully to the roots twice a week was found to be a quick-acting stimulant. In this way succulent leaves are produced abundantly before the larvæ have time to develop. When, however, a bed is badly infested, the only plan is to cut the whole bed and water freely; the new growth will also start more quickly if the beds are shaded.

In the North-west Territories and Western Manitoba the RED TURNIP BETTLE (*Entomoscelis adonidis*, Fab.) did some harm to cabbages and turnips, but the beetles were easily disposed of where Paris green was applied.

The STRIPED CUCUMBER BEETLE (*Diabrotica vittata*, Fab.) was the cause of much loss on melons, squashes and cucumbers in several parts of Ontario. The injury is done by the perfect beetles to the flowers and leaves, and by the grubs to the roots in which they burrow. The remedies which have given the greatest satisfaction are dusting the plant with Paris green and dry ashes (1 to 50) or covering them, until the runners are produced and the plants become too large, with a piece of gauze or cheese cloth, supported by two or three sticks stuck into the ground, and with the edges held down by a handful of earth on each side. This means of protection was first suggested by Dr. Clarence Weed in a bulletin of the Ohio Experiment Station for September, 1889, and has been used with much success by some of my correspondents, particularly in garden culture. For preventing egg-laying and also for killing the young larvæ, putting a small quantity of tobacco dust or sand, impregnated with coal oil, close round the base of the stems, is useful if the gauze covers above mentioned are not used.

THE CLOVER CUT-WORM (*Mamestra trifolii*, Esp.).—During the month of August I received from a few localities in Peterborough county, Ont., specimens of caterpillars of the Clover Cut-worm, with the information that they were damaging pease and turnips severely, and some other crops. They were so numerous that they had assumed the Army-worm habit of marching from field to field in search of food. The Clover Cut-worm is a thick, green, smooth caterpillar with black or gray markings extremely variable both in the depth of the ground colour and the shape and extent of the markings, some specimens appearing to be all green, while others have the dark markings so extensive as to cover the whole of the upper surface. Length, about one and a half inches. A more exact description of the full-grown caterpillar is as follows :—

"A dark-green noctuid caterpillar with a very narrow dorsal stripe, a broken sub-dorsal stripe of yellow, edged above by velvety black blotches (the black line not quite as continuous as the yellow); below the breathing pores, a broad pink band, narrowly edged with white above and below. Above the upper white line is a black one which spreads out into a black blotch around each spiracle. The whole body mottled with white on a smooth green surface, giving a somewhat glaucous shade to the green. The narrow dorsal stripe consists of an aggregation of these mottlings, and the dorsal space has them shadowed with black, giving that area a darker appearance than the rest of the body. Legs and pro-legs green, like the body. Head green, bearing on the upper part of the face and on the cheeks clouds of white mottlings. Some of these caterpillars were simply pale green with fuscous markings, others were green, with clear brownish or black markings, some had the mottling all over the body so shaded with brown as to suggest the appearance of the Army-worm. Specimens intermediately tinted between all these colours occurred."

"Birdsall, Peterborough Co., Ont., August 10.—By this day's mail I send you a box with half a dozen worms that have nearly destroyed a field of pease for me. Kindly tell me the name of them, and if it would be safe to sow the field with fall wheat next month, or would they be apt to come and destroy it next year or this fall? The ground is nearly covered with them. They first appeared about two weeks ago. They have destroyed several patches of turnips in the neighbourhood. I also send you a sample of the pea vine as partially eaten by them.

"August 17.—Thanks for your prompt answer to my letter in regard to the caterpillar. It may be as you state, that the damage to the pease will not be as great as I at first expected, as they hardened up so quickly that the worms had to leave. They all started off in a south-eastern direction and will by this time have all fallen into the river or lake. They have not attacked my turnips, as they are to the west of the field, but many of my neighbours to the north and west are having their turnips destroyed by them."—F. BIRDSALL.

"Birdsall, Peterborough Co., Ont., November 25.—The turnips injured grew right besides a field of pease, and for a time we thought some new insect pest had made its appearance, but when we came to cut the pease the mystery was explained, as they were

evidently the same kind of caterpillars as are always found on pease, only, this year they were very much more numerous than usual and crossed over from the pease to the turnips. The green leaves near the ends of the pea vines and the ends of the vines themselves were eaten, but the pease were too nearly ripe when they were attacked to be injured much. I never before saw anything like it. The ground was literally alive with the crawling insects. We put Paris green on the turnips, and this doubtless helped, but the insects were so numerous that one set after another took the place of those killed. The turnips near the pease were injured most and as you receded from the edge of the pease the injury lessened. The turnips put forth a new set of leaves, but the growth of the roots were stunted and they were only about half a crop. There seemed to be about half a dozen different kinds of caterpillars. I could see no difference between some of them and the ordinary cabbage worms. Then there were all shades of green and brown with various markings, some with two rows of yellow stripes, others with two rows of yellow dots along the back, others with black dots, and some simply a shade of green, brown or black. I did hear of caterpillars being plentiful in some parts of adjacent townships, but in this immediate neighbourhood I do not think the injury caused by them was very great. They were on no crops near here, only pease and turnips, and the turnips alone were greatly injured."—ROBERT TUDHOPE.

"Villiers, Peterborough Co., Ont.—The green caterpillar which destroyed our turnips did not touch our pease, but there were thousands of them on turnips and carrots, doing much injury. One of my neighbours, Mr. James Fife, says there were millions on his turnips and carrots, injuring the crop about half. Mr. George Webber used Paris green on his turnips, but with little effect, as the numbers were so great."—PHILIP W. ELMHIRST.

Remedies.—When these caterpillars assume the habit of the Army-worm of marching from field to field, ploughing a deep furrow across their path is a useful check. If sufficiently abundant, as will rarely be the case, to fill up the furrow, they may be easily destroyed by dragging a heavy log over them. When they occur on roots and other crops, the only practical method of destroying them is dusting or sprinkling the plants with a Paris green mixture. Ploughing late in the autumn is also recommended. As the Clover Cut-worm passes the winter in the chrysalis stage inside a slight cell a short distance beneath the surface of the soil, late ploughing will disturb many and expose them to the frost and to predaceous enemies.

THE ZEBRA CATERPILLAR (*Mamestra picta*, Harris).—A good many letters of complaint have been received concerning the work of the well known Zebra Caterpillar, which was abundant in the eastern parts of Ontario. There are two broods of this insect every year. The moths of the first brood issue from the chrysalis during May and lay their eggs in large clusters on the under sides of leaves of many different plants. These hatch in a little more than a week, and the young caterpillars for a time feed gregariously, devouring all the green cellular portion and making large conspicuously white patches on the leaves. As they grow larger, they separate and feed singly. The caterpillars of the first brood are full grown about mid summer, when they are large caterpillars, two inches in length, beautifully ornamented, velvety black on the back, with two golden yellow stripes connected by narrow white lines along the sides. The head, thoracic feet and pro-legs are bright reddish brown. When full-grown these caterpillars spin slight cocoons just beneath the surface of the ground and the moths emerge about the first week in August; they are rather dull-coloured, purplish-brown moths, with white under-wings, expanding about one and a half inches across the opened wings.

The eggs for the second brood are laid throughout August and into September, and the caterpillars are to be found, as a rule, later than those of any other of our moths. Being conspicuously coloured, they are often noticed crawling about looking for food late in the autumn when most kinds of plants have been frozen and killed. The winter season is passed in the chrysalis state beneath the ground.

The crops most attacked by the Zebra Caterpillar last season were pease, and particularly sweet pease in gardens, turnips, clover, potatoes and cabbages. In addition to these, however, these insects levied heavy toll in the flower garden attacking indiscriminately almost all annuals. The eggs and clusters of young caterpillars of the second

brood were found in remarkable numbers at Ottawa during August on lucerne, and on lily and gladiolus leaves.

The eggs were much infested by two minute parasites, *Trichogramma pretiosa*, Riley, and *Telonomus* sp., noticed in the same connection in 1892, and the young caterpillars were also destroyed by an *Apanteles* which occurred both at Ottawa and at Birdsall, Ont.

"Birdsall, Peterborough Co., Ont., August 18.—There are two kinds of caterpillars which are doing a good deal of harm on my turnips, a green one and a yellow and black striped one. I suppose a little of the Paris green and plaster mixture would be the best thing for them. Kindly let me know if you think there would be any danger in feeding roots so treated to stock."—F. BIRDSALL.

"Omemee, Victoria Co., Ont., August 18.—I send you some striped caterpillars which I find in numbers on the turnips, a great many together on a single leaf; they seem to eat the upper surface principally. There are with them, also abundant but occurring singly, some green ones which eat the edges of the leaves, No. 2, and besides a few of the smooth green ones with dark marks, No. 3, which feed like No. 2."—E. S. MORGAN.

The green caterpillars mentioned by Mr. Birdsall and the No. 2 of Mr. Morgan's sending were those of the small White Cabbage Butterfly (*Pieris Rapæ*, L.). Mr. Morgan's No. 3 were specimens of the Clover Cut-worm (*Mamestra trifolii*, Esp.).

"Peterborough, Ont., September 3.—The inclosed worm is very abundant in this neighbourhood this season; it feeds on the leaves of turnips."—J. A. FIFE.

Remedies.—The best remedy for these caterpillars is spraying or dusting with arsenical mixtures, but they seem to be rather resistent to the action of those poisons generally used, such as Paris green. Mr. T. W. Ramm, of Ross Mount, Northumberland Co., Ont., writes: "You know the yellow-striped caterpillars of *Mamestra picta* which are sometimes plentiful on pease. It took almost two days to kill some of these which were on pease, although I almost buried them in dry Paris green of full strength tested with ammonia and then it destroyed the pease as well." A weaker mixture distributed evenly over the food plant would probably have been more fatal to the caterpillars without injuring the pea plants—1 lb. of Paris green to 200 gallons of water or to 50 lbs. of dry land plaster was quite satisfactory at Ottawa.

No danger need be apprehended from feeding roots to stock which have been dusted or sprayed with Paris green mixtures. There are always several weeks—and this at a rainy season of the year, too—between the time that this is likely to be necessary and when the roots are fed to stock. If there is any doubt, however, about all the poison being washed off the roots, the tops can easily be cut off closer to the root than usual, which will remove all possibility of danger. The poison could only lodge in the axils of the leaves, of which a clean sweep will be made when the leaves are cut off.

Owing to the gregarious nature of the caterpillars when young, good work can be done in August and September by picking off the leaves bearing the young broods and destroying them.

SMALL WHITE CABBAGE BUTTERFLY (*Pieris Rapæ*, L.).—It will be noticed in the above extracts that this insect was twice mentioned as injurious to turnips. There were other reports of the same nature, but the chief injury mentioned by correspondents was to cabbages. There are few insects more easily controlled than this, if prompt action be taken at the proper time.

The best remedy for this insect, as far as my experience goes, is undoubtedly pyrethrum powder diluted with four times its weight of common flour and then kept in a tightly closed vessel for twenty-four hours until the poisonous principle has permeated the whole mixture. If a small quantity of this mixture be dusted over infested plants, the caterpillars are all destroyed, and in a surprisingly short time. Pyrethrum or insect powder kills by contact, both in a dry condition and as a decoction, so that such caterpillars as are not actually reached by the powder are destroyed by the poisonous principle of the pyrethrum carried farther among the leaves by rain or condensed dew. This remedy is so effective and so cheap that I do not think it well to recommend any other.

It has also the very great advantage of being perfectly safe, because, although so fatal to all insects, it has no poisonous effect on man and the higher animals.

The COLORADO POTATO-BEETLE (*Doryphora 10-lineata*, Say) seems to be, on the whole, the most troublesome farm insect in the country. Prof. Panton, of Guelph, Ont., expresses the same opinion in his report on answers received to the questions he had sent out to the farmers of Ontario as to which were, in their experience, the insect pests most injurious to farm crops. In most places, however, growers have generally adopted the easy and cheap means of keeping it in check by spraying or sprinkling the potato plants with Paris green mixed with water or some dry powder as a diluent. This remedy, when applied with ordinary care, answers its purpose most effectively.

"The potato-beetle was reported as numerous by some correspondents, while others stated that it was not nearly so bad as usual."—*Ontario Crop Report, Aug. 13.*

"Point de Bute, Westmoreland Co., N.B.—The potato-beetle did less damage this season than last."—HOWARD TRUEMAN.

"Alberton, P.E.I.—The Colorado beetle came out of winter quarters later than usual this spring and many were congratulating themselves that it would not show itself, but it soon got to work, and if the potatoes were late in coming up, it stood right by, waiting their arrival, utilizing the blades of grass for egg laying in the meantime. Good Paris green saved the crop. Farmers have improved ways of 'greening' now. As a general thing, a cask on a cart or truck, provided with a sprinkler at each side, thus covering quite a number of drills at a time, made the work light. The acreage under potatoes is restricted now. A farmer seldom plants more than a couple of acres. They are low-priced, and the bug has raised the cost of production. I really think, though, that this bug is running its course."—REV. A. E. BURKE.

"That great potato pest, the Colorado potato beetle, seems to be much less dreaded than formerly. It seems to have been well kept in check by the use of Paris green, either sprayed on the vines or dusted on after being mixed with gypsum or land plaster."—*Nova Scotia Crop Report, November.*

According to the notes from the different districts of Nova Scotia, contained in the above crop report, the potato-beetle was particularly troublesome in the north-western counties, but much less in the others

"Yarmouth, Yarmouth Co., N.S.—I have not yet seen a potato-beetle in my county. A few have appeared in widely separated localities since 1893, when the first were noticed, but this is the fourth year since, and there has not been at any time a marked increase in serious injuries from them in this county."—CHARLES E. BROWN.

"Glace Bay, Cape Breton, N.S.—Insects this season did much less damage to vegetation. Chief among them is the Colorado Potato-beetle, which made things pretty lively for the farmers round my home. Some used Paris green, others hand picked them. The beetles do not seem, however, to be so numerous as at first."—JAMES W. EDWARDS.

"Upper Baddeck, Victoria Co., N.S.—The potato bugs were very plentiful. I did not learn that any in this district used Paris green, as they are somewhat afraid of its poisonous effects. We, however, find that if we commence early, when the beetles first show themselves, to spray the fields carefully three or four times in as many weeks, it leaves them powerless to do much injury when the vines get strong."—ALLAN MCMILLAN.

"Berwick, King's Co., N.S.—The potato bug has become so general that it is taken quite as a matter of course, and the farmer expects to use Paris green quite as much as he expects to plant his seed."—S. C. PARKER.

CUT-WORM injuries in garden and field crops have this year been frequently reported. The most severe depredations were committed in New Brunswick, Nova Scotia and in Alberta District; strange to say too, it was by the same species the Red-backed Cut-worm (*Carneades ochrogaster*, Gn.). It is seldom that correspondents trouble to send in cut-worms, but when this was done, in almost every instance, the species was found to be the above which gave trouble during the spring of 1896. Although there are so many different species of cut-worms, their general habits are now so well known that a wide-awake gardener or farmer can by prompt attention and a little trouble, as a rule,

do a great deal to prevent serious loss. Cut-worms are the caterpillars of dull-coloured active moths belonging to the *Noctuidæ* or Owlet Moths (Fig. 12), of which there are upwards of 400 different kinds in North America. The caterpillars of these different kinds vary somewhat in their habits, but, on the whole, they are very similar, being smooth, almost naked, gray-looking caterpillars (Fig. 13) of some dull shade of colour similar to the ground in which they hide during the day. The head is smooth and shining as well as a small horny plate on the segment next to the head. Their habits are almost always nocturnal; lying hid by day just beneath the surface of the soil, they come out at night to feed. When they occur in large numbers, they change their habits somewhat and feed by day as well, owing to the reduced food supply consequent upon their ravages. The eggs from which cut-worms hatch are laid by some species in the autumn and by others in the spring or summer and, as a consequence, cut-worms of all sizes can be found in the spring; for these insects, according to the species, may pass the winter in the state of either a perfect moth, a chrysalis, a partially grown caterpillar, or an egg. This last habit is that usually, if not always, followed by the Red-backed Cut-worm. Eggs laid in Ottawa in October did not hatch until the end of the following April, and the caterpillar took 6 weeks to reach full growth; they were then large cut-worms over 1½ inches in length, gray, with a broad sienna-red stripe down the middle of the back. The moths did not emerge until 5 weeks after the caterpillars buried themselves to turn to chrysalids. This cut-worm is particularly injurious. It is a large voracious species with an exceptionally wide territorial distribution and feeds upon almost all kinds of succulent vegetation. Nearly all the references in the following extracts were to the Red-backed Cut-worm.

Fig. 12.—A Cut-worm Moth (*Agrotis clandestina*).

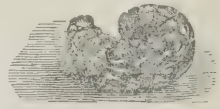


Fig. 13.—A Cut-worm (*A. clandestina*).

"Edmonton, Alta.—Cut-worms as busy as ever in the Peace River District."—C. Burton.

"Edmonton, Alta., June 16.—Everbody about here is troubled with cut-worms, which have done great damage, necessitating the sowing of gardens over again."—Francis C. Clare.

"South Edmonton, Alta., July 13.—I send you a box containing cut-worms. They are most destructive, cutting off cabbage and all root crops just under the ground. If you remove the earth from a bitten off plant, you find the grub buried just beneath. They are general throughout this district."—I. L. Andrews.

"Lacombe, Alta.—I tried alsike clover here; it came up splendidly; but the ground was so full of cut-worms that they took almost the whole of it, although I sowed about six acres."—Harry Sargent.

"Cochrane, Alta.—This summer for the first time cut-worms were very bad on my cabbage crop; they cut the plants off close to the ground."—John Dartigue.

"Calgary, Alta.—I have a fair-sized vegetable and flower garden here. This spring my garden swarmed with cut-worms, as did gardens of others in the neighbourhood. The worm is just the colour of the soil; it burrows into the ground by day and comes up at night to feed. These insects gave no trouble after the first or second week of June. I had to plant three crops of every thing before I could get the start of them. The vegetables the worms went for were onions, beets, parsnips, carrots, peas, beans, turnips, radishes, lettuce. Can you advise me what to do to rid my garden of this pest?"—E. D. H. Wilkins.

"Victoria, B.C., June 12.—Cut-worms have been hard at work about Victoria. One grower lost all his onions, and I have heard complaints from many others."—J. W. Tolmie.

At the same time specimens were also received from Mr. Mont. McDonald, of the same place.

"St. John, N.B., May 27.—Please send me some information about cut-worms. Last year in the garden at my summer house out of town we were very much troubled

with them. It seems impossible to destroy them. Can you give us a remedy?"—W. WATSON-ALLEN.

"Sussex, N.B.—Cut-worms in the spring were a terrible pest, and several men who make a habit of growing some hundreds of barrels of onions in this section were unable to grow any at all."—W. W. HUBBARD.

"Fredericton, N.B.—We had a regular plague of cut-worms last spring. Our root crops, and to some extent the corn and grain, were much damaged by them. I knew a field that was re-seeded four times."—PERCY C. POWYS.

"Petitcodiac, N.B.—The cut-worm is our worst enemy and is worst on sod, even if ploughed fall and spring."—B. SINCLAIR SMITH.

"Halifax, N.S., June 27.—How can I destroy cut-worms? It is impossible to grow anything in some lands in this neighbourhood, even in newly turned up soil. They are destroying my ensilage corn."—R. HUNT.

"Berwick, King's Co., N.S.—Cut-worms were very destructive in Nova Scotia this summer: many fields of beans, turnips, cabbages and tomatoes were much injured. Our cabbage and tomato crop was only saved by wrapping the stems with paper as the plants were set."—S. E. PARKER, *Secretary, Fruit Growers' Ass., N.S.*

"Nappan, Cumberland Co., N.S.—Cut-worms bothered us a good deal, but were extremely destructive in Yarmouth Co."—W. S. BLAIR.

"Yarmouth, Yarmouth Co., N.S.—Cut-worms abounded throughout the county, destroying successive sowings of vegetable crops. They are estimated to have reduced mangels by 15 per cent."—C. E. BROWN.

"Bear River, Digby Co., N.S.—Cut worms did a great deal of harm in the spring to all kinds of vegetables."—R. G. TURNBULL.

"Chester, Lunenburg Co., N.S.—Cut-worms destroyed gardens."—E. D. LORDLY.

In the Nova Scotia *Crop Bulletin* for November, 1896, cut-worm injuries are recorded in the counties of Digby, Lunenburg, Pictou and Yarmouth.

"Alberton, P.E.I.—We were much troubled with cut-worms in our gardens in late May and June. Some people lost all their young vegetable plants, having been, I think, too careful to pull out all the weeds early. The dry weather suited the worms. At night in June and July you could hardly see out of the windows from the numbers of the clumsy brownish gray moths of this pest."—REV. A. E. BURKE.

Remedies.—The remedies for cut-worms are active or preventive. The chief active remedies are, poisoning the caterpillars, which may be done effectively in two ways, or hand-picking:

1. Traps.—Large numbers may be destroyed by placing between the rows of an infested crop, or at short distances apart on infested land, bundles of any succulent weed or other vegetation which have been previously poisoned by dipping them into a strong mixture of Paris green (2 ounces to a pailful of water). The cut-worms eat the poisoned plants then they bury themselves and die. In hot dry weather these bundles should be placed out after sun-down, and a shingle may be laid on each to prevent fading.

2. Poisoned Bran.—Striking results have been obtained during the last two years by putting along rows, or at the base of such plants as tomatoes and cabbages, a small quantity of the following mixture which is mentioned in Prof. J. B. Smith's excellent new *Manual of Economic Entomology*:—

Thoroughly mix together in a dry state 50 pounds of bran and 1 pound of Paris green; then add water a little sweetened with sugar until the whole is thoroughly wet but not sloppy. Prof. Smith says: "This mixture is extremely attractive to cut-worms, being preferred to plants in all the instances which have come under my notice. It takes about ten pounds of this mixture to an acre of potatoes as ordinarily planted."

The same mixture has been used dry by Mr. F. A. Sirrine of Geneva, N.Y., with, he claims, even better results than the wet mixture, which is apt to get mouldy.

3. Hand-picking, or digging up the cut-worms whenever a plant is seen to be cut off, should, of course, always be practised.

Preventive remedies consist of:

4. Clean culture, by which all vegetation is removed, upon which the young caterpillars could feed in the autumn or which would attract the moths to lay their eggs.

5. Banding.—Cut-worms are heavy-bodied insects unable to climb over smooth surfaces ; therefore, surrounding a plant or tree with a band of tin or even of paper in the case of such plants as cabbages and tomatoes is an effective means of protection. Tin bands may easily be made by taking pieces of tin six inches long by two and a half wide and bending them around a spade or broom handle so as to form short tubes. In placing them around a plant, the two ends can be sprung apart to admit the stem and then the tube should be pressed a short distance into the ground. I have found this a useful means of disposing of tomato and other cans. To prepare these easily the cans need only be thrown into a bon-fire, when the tops and bottoms fall off and the side becomes unsoldered. The large piece of tin can then be used whole or may be cut down the centre with a pair of shears so as to form two bands. It may be well to mention here that the two remedies so often recommended in newspapers, salt and lime, have proved quite worthless in our experiments for preventing cut-worm injuries.

FRUITS.

The fruit crop of Canada, particularly of apples, has this year been enormous, and compared with other years, there has been little complaint of insect injuries. Wherever spraying with Paris green, either alone or mixed with fungicides, has been practised, marked results have been obtained. These would, of course, have been much more noticeable in a year of less abundant fruitage. It is to be regretted that this most useful means of saving money is not more universally adopted by the fruit growers of the Dominion.

Two new pests of the apple, the Apple Fruit-miner in British Columbia, and the Apple Maggot in Ontario, have demanded attention on account of their injuries during the past season. These are treated of at some length later.

The Codling Moth (*Carpocapsa pomonella*, L.) has, as usual, been mentioned frequently in correspondence, but, on the whole, owing to the enormous apple crop and also to the more general adoption of spraying, has not done much harm.

"Berwick, King's Co., N.S.—Codling Moth did but little injury. Fruit seldom was so free from worms."—S. C. Parker.

The only mention of this insect in the Nova Scotia *Crop Report* for November, 1896, is the following :

"Lawrencetown, Annapolis Co.—Very few wormy apples."—J. W. Whitman.

In the Ontario *Crop Returns* for August, 1896, there are only two correspondents who mention this insect as follows :—

"Plympton, Lambton Co.—There are no worms in the apples so far this year, even where spraying has not been done."

"Ashfield, Huron Co.—Spraying was little practised and yet the fruit is almost free from fungi and worms. This is unusual, and spraying with proper mixtures should not be disregarded, for this exemption may not occur again."

"Grimsby, Wentworth Co., Ont.—The second brood of Codling Moth has been very troublesome this year in some orchards, particularly where spraying has been neglected. One of my orchards on the hill-side was very difficult to reach with the spraying waggon, and, therefore, it was neglected. As a result, a very large proportion of the apples were affected and had to be thrown out as seconds. Although spraying for fungi has not been so necessary this year, yet spraying for Codling Moth has been as necessary as ever."—L. Woolverton.

"St. Catharines, Lincoln Co., Ont.—The Codling Moth has not been quite so bad as usual, though the enormous crop of apples pointed to by the sceptical as evidence of the futility of spraying is rather misleading. The number of Codling Moths active this year would have made a very different showing if the crop of apples had been a small instead of an abnormally large one."—Martin Burrell.

"Freeman, Halton Co., Ont.—In the younger apple orchards the Codling Moth did a great deal of damage, a large proportion of otherwise very fine apples being injured. The thinner the crop on a tree, the greater was the proportion of wormy apples. Some varieties seem more liable to attack than others. With me the Greening seems always to be the worst infested. The Baldwin, too, suffers a great deal, as well as the Roxbury Russet. The Ribston Pippin, Blenheim, King and Cranberry appear to get off better."—A. W. PEART.

"Craighurst, Simcoe Co., Ont.—Little damage from Codling Moth this year."—G. C. CASTON.

"Hamilton, P.E.I., Sept. 14.—Where spraying is attended to, the Codling Moth is a thing of the past."—H. A. STEWART.

TENT CATERPILLARS (*Clisiocampa*).—These easily destroyed caterpillars have caused much loss in several parts of Canada this year.

"Freeman, Halton Co., Ont.—The Tent Caterpillars have not been troublesome in the Burlington district this year, but some ten or twelve miles north of here they almost amounted to a plague, whole orchards, in some cases, being stripped of their leaves before the owners realized the fact. There was then a general attack made on them, chiefly by crushing their nests in the evenings and mornings. Spraying effectually disposes of them with me."—A. W. PEART.

"Berwick, King's Co., N.S.—The Tent Caterpillar seems to thrive best in the villages. It seldom becomes numerous in isolated orchards. I think the ornamental trees in towns and villages prove a good breeding ground for this insect. The usual formula—4 ounces of Paris green to 40 gallons of water—applied twice will exterminate this enemy."—S. C. PARKER.

"Alberton, P.E.I., Aug. 3.—The Tent Caterpillars seemed to be more numerous than ever. They were the chief leaf-eaters this season."—REV. A. E. BURKE.

"Hamilton, P.E.I.—The most troublesome insect this season has been the Tent Caterpillar."—H. A. STEWART.

"Victoria, B.C.—Tent caterpillars have been very destructive to the foliage of fruit trees in many places, especially Chilliwack, and I notice that the eggs are numerous everywhere in the orchards."—R. M. PALMER.

Effective remedies for Tent Caterpillars are hand-picking of the eggs in winter and the destruction of the colonies of young caterpillars when the young leaves are unfolding, at which time they are conspicuous by reason of the copious white silky web upon which they rest. If not attended to at this time, spraying with Paris green disposes of them easily.

THE EYE-SPOTTED BUD-MOTH (*Tmetocera ocellana*, Schiff.) has been troublesome in certain districts.

"St. Catharines, Lincoln Co., Ont.—I inclose a peach pest which I consider the most dangerous insect I have met with."—A. GLASS.

"Olinda, Essex Co., Ont.—I send you a number of peach twigs injured by a pest which I have not noticed before. This spring a great many trees are badly infested, the young shoots even being attacked, the insect boring down through them."—J. O. DUKE.

"St-Henri de Montréal, Que., June 8.—I notice the bud-moth and leaf-roller have been very bad in some orchards in this neighbourhood. I have kept them subdued by the use of Paris green and the Bordeaux mixture."—R. BRODIE.

"Victoria, B.C.—I have found the Bud-moth is increasing in numbers in our orchards. I hope that the use of Paris green in combination with the Bordeaux mixture will soon become general in lower British Columbia, as the numerous leaf eating pests are becoming much more destructive."—R. M. PALMER.

This insect is certainly a difficult one to cope with and also, from its habits of attacking the flower buds and boring down into the fruit spurs, its injuries are frequently very serious. The remedy which has given the best results is to spray very early, just when the buds are bursting. The partially grown caterpillars pass the winter snuggly ensconced in silken shelters on the twigs of trees which they infested the previous autumn. About the time the buds open, they leave these shelters and crawl out to the tips of the twigs where they do much harm to the unfolding buds.

CANKER-WORMS have been complained of as usual in many localities, and the importance of early spraying while the caterpillars are very small has been again shown. Two or three correspondents mention that they have been unable to control this insect, even when spraying with a mixture strong enough to burn the foliage. A very serious out-break occurred in Pelham township, Monck County, Ont., and another near Fredericton, N.B.

THE CIGAR CASE-BEARER (*Coleophora Fletcherella*, Fernald) has been mentioned by correspondents in all provinces in Eastern Canada, but no complaints of serious attack have been received. Mr. Harold Jones, of Maitland, Grenville Co., Ont., noticed the young Case-bearers moving from their winter resting places out to the buds on 2nd May last. He sprayed at once with the kerosene emulsion (Riley-Hubbard formula), 1 to 12, with the result of practically clearing his orchard of this insect.

THE OYSTER-SHELL BARK-LOUSE (*Mytilaspis pomorum*, Bouché) continues to trouble the apple grower in many districts. It occurs in every province of the Dominion and spreads rapidly, particularly in neglected orchards.

"Baddeck Forks, Victoria Co., N.S.—The scale insect is the greatest pest. All our apple trees will be killed in a few years more if we cannot stop its ravages."—A. B. WATSON.

"Nappan, Cumberland Co., N.S.—The apple tree bark-lice give me the most trouble I used kerosene emulsion twice in June, but there are still many on the trees. Do you think the application now of a mixture made up as follows would not be advisable: concentrated lye, 3½ lbs.; fish oil, 1 gallon; water, 8 gallons? It seems impossible to get kerosene emulsion to all parts of the tree when in foliage. I do not think they are troubled much with this pest in the Annapolis valley; at least, I never noticed many there. But, all through the country where I have been, trees are being killed or at least stunted by the bark-louse."—W. S. BLAIR.

"Berwick, King's Co., N.S.—As usual the bark-louse gains ground on trees tha are not in good cultivation. Alkaline washes which are recommended will clean the trees up completely, and I think that the thorough applications annually will also prevent the work of the shot-borer (*Xyleborus dispar*, Fab.)."—S. C. PARKER.

"Alberton, P.E.I.—If we cannot soon get means to destroy the Oyster-shell Bark-louse, we shall have to give up raising apple trees."—JOHN T. WEEKS.

"Lakeville, P.E.I.—Please send me receipt for wash to destroy bark-lice on apple trees. They are fast destroying our trees."—JOHN J. MCINNIS.

"Freeman, Halton Co., Ont.—The Oyster-shell Bark-louse has had its day in this district. There are but few left, and these only on neglected trees. Ten years ago they threatened to sap the life out of the orchards."—A. W. PEART.

The recognized remedies for the Oyster-shell Bark-louse are spraying the trees, before the buds burst and again in June when the young are moving, with the Riley-Hubbard kerosene emulsion (1 to 9). At the same time a healthy, vigorous growth should be induced by judicious pruning of the trees, manuring the roots and cultivating the soil.

Several instances have been brought to my notice, which would indicate that trees badly infested with the Oyster-shell Bark-lice, after having been sprayed with Bordeaux mixture, were much freer from these insects. This was possibly due to the fact that twigs bearing a coating of Bordeaux mixture were thereby rendered distasteful or unsuitable for the young bark-lice when seeking a spot to settle.

The PEAR-TREE SLUG (*Eriocampa cerasi*, Peck), has been very abundant in Ontario, Quebec and British Columbia. I cannot help thinking that the reason this pest of the pear, plum and cherry is so prevalent every year, is that the late broods are neglected. Spraying with the standard mixture of Paris green (1 pound in 200 gallons of water with 1 pound of fresh lime) is always fatal to the larvæ.

"Grimsby, Ont.—The Pear-tree Slug has been more destructive than usual. It has skeletonized the leaves of the pear, plum and common cherry trees, and, where it has been left unchecked, has done a great deal of damage in stunting the growth of the

trees. The second brood is more troublesome to us than the first, because at that season fruit-growers are so busy that it is almost impossible to find time to spray with Paris green."—L. WOOLVERTON.

"St. Catharines, Lincoln Co., Ont.—The Pear-tree Slug has done more damage than most pests in this district, familiar as it is and easy to fight as it is. I think I am well within the mark in saying that it has been far more destructive than in any season for the past decade. The second brood worked very freely on the plum as well as on the quince, cherry and pear, and thousands of young trees—particularly cherry—had their leaves skeletonized."—MARTIN BURRELL.

The PLUM WEB-WORM (*Lyda rufipes*, Marlatt).—When travelling through the Mennonite country in Southern Manitoba in the first week of July last I noticed a great deal of damage done to plum trees by the gregarious false-caterpillars of a saw-fly which webbed together the leaves of small branches and soon stripped them of all green cellular portions in a very similar manner to the larvæ of the Cherry-tree Tortrix (*Cacœcia cerasivorana*, Fitch). Upon examining the webs I found them to be filled with enormous numbers of a false-caterpillar of a species of saw-fly belonging to the genus *Lyda*, which was quite unknown to me. The larvæ were nearly $\frac{3}{4}$ of an inch in length, grayish above, yellowish or pinkish below; head yellow, thoracic shield and feet as well as the tip of anal segment, black; pro-legs wanting. They have two seven-jointed antenna-like appendages, protruding from the front of the head, and also two others three-jointed, from each side of the last segment. I was unable to rear the perfect insects, but I find a description of what is evidently the same species by Prof. T. A. Williams in *Bulletin 48*, April, 1896, of the South Dakota Experiment Station, in which the insect is described and figures are given of the perfect insect, the cluster of eggs and a bunch of sand cherry infested by the larvæ. It is described as one of the most destructive insects attacking plums and cherries. It feeds upon all the common forms both wild and cultivated. It is found most often on the common wild plum (*Prunus Americana*, Marsh) and the sand cherry (*Prunus pumila*, L.). Prof. Williams describes the mature insect as much flattened, with body, head, antennæ and feet shining black, legs reddish. He gives as the date of appearance of the flies the second week of June. The larvæ which I found in Manitoba were full-grown in the first week of July, and at that time most of the plum trees in the gardens of the Mennonites over an area of many miles were almost entirely defoliated.

The eggs are deposited in close masses along the under side of the mid-rib of the leaf, the long axis of the eggs lying parallel with the mid-rib. The younger leaves are invariably selected, and the eggs laid before the leaf has expanded. Immediately on hatching, the young larvæ begin to spin a web and feed through or crawl over to the upper surface of the leaf. As they continue to grow, they travel to other leaves and envelop all in a tough web not unlike that of the tent caterpillar. A large colony will spread over the whole side of a tree before the insects become full-grown. When ready to pupate, the larvæ go to the ground and gradually envelop themselves in cocoons, turn to pupæ and emerge again [the next year] in the late spring or early summer as mature insects."—(*South Dakota Experimental Station, Bulletin 48*).

As a remedy, plum trees should be sprayed with Paris green or dusted with white hellebore as soon as the webs appear.

It is just possible that this insect may be the *Lyda fasciata* of Norton, described and figured by Prof. A. S. Packard on page 524 of his *Forest Insects* under "Cherry Insects." But, until specimens are secured of the Manitoba insect, it will be impossible to identify the species with certainty. From the manner of occurrence of the colonies seen in the Mennonite villages, the idea of an imported species is suggested, such as *Lyda pyri*, Schrank, mentioned in Miss Ormerod's last report, as having caused a similar injury in English orchards. Synonyms of the latter are also *L. clypeata*, Klug; *L. fasciata*, Curtis and Westwood, and *Pamphilius flaviventris*, Cameron.

The SAN JOSÉ SCALE (*Aspidiotus perniciosus*, Comstock).—An important discovery has been made by Mr. R. M. Palmer of undoubted specimens of the San José scale in Vancouver Island. From the appearance of infested wood forwarded, the pest must have

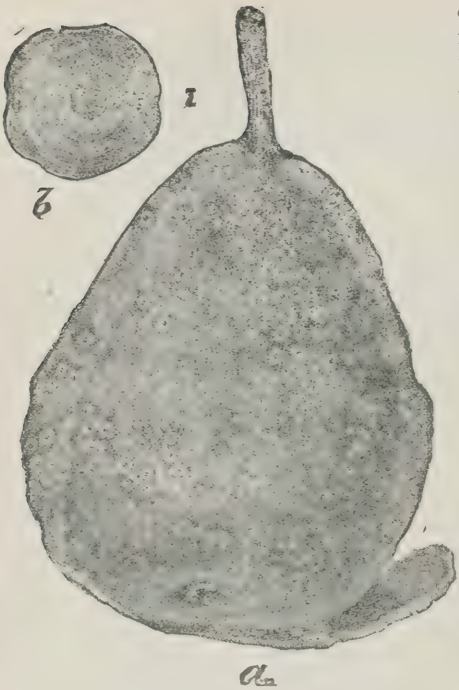


Fig. 14.—Pear attacked by San José Scale; *b*, scale much enlarged.

existed for some years on the trees where it was found. So that there might be no mistake as to the identity of the species, specimens were sent to Dr. Howard, United States Entomologist, who confirmed Mr. Palmer's opinion.* In a most interesting report sent to me by Mr. Palmer on the insect injuries of the year, he writes of the matter as follows:—

"Victoria, B.C., Dec. 10.—I am sorry to report that I have found San José Scale in two orchards on Vancouver Island. The infested trees have been destroyed, and, of course, trees and bushes in their vicinity will be closely looked after the coming season. I may say that the popular opinion that San José Scale will kill the trees in three years, is not borne out by observations made here on these infested trees. One of them, at any rate, had apparently been infested for a much longer period, and it was still growing. I find it difficult to detect the presence of the scales on the trees, or, rather, very close observation is required. In both of the above cases my attention was drawn to them by the characteristic marking of the fruit growing on the trees, caused by the insect."

"Victoria, B.C., Dec. 29.—*Re* San José Scale: I send you part of the infested wood and twigs I have. It is rather dried up now, but when fresh the characteristic marking of the twigs, leaves and fruit, due to the work of the insect, was very evident, and there was no doubt as to the identity. It was the bright discoloration of the fruit which first drew my attention to the presence of the insects in both the cases found. A microscopic examination was also made on my return to Victoria, which confirms this opinion."—R. M. PALMER.

The limits of distribution of the San José Scale, like those of all other insects, are undoubtedly controlled to a large extent by climate. It has been found from long-continued observation that both animals and plants are restricted in their distribution to what have been called "life zones," which are determined, according to Dr. C. H. Merriam, the eminent zoologist, "by the total quantity of heat during the season of growth and reproduction." The San José Scale occurs more or less in all the States lying to the south of the great lakes, and although the data upon which life zones could be laid down accurately in Canada are too meagre to be of use in consideration of the question whether this insect would be likely to spread and become a serious enemy of the fruit grower in Canada, there is no doubt that it must be regarded as a very possible danger, at any rate in those parts of Ontario which lie along the north shore of Lake Erie, extending perhaps from the County of Essex to the County of Wentworth. It was supposed at one time that the San José Scale would not thrive east of the Rocky Mountains, but we now know that this supposition was erroneous; therefore, all fruit growers, particularly in that part of Ontario mentioned above, are urged to be keenly on the alert to watch for and report promptly any occurrence of this or any other scale insect which resembles it, either in their orchards or upon young nursery stock imported from the United States. In cases of doubt, specimens should be forwarded for examination, as soon as detected.

---

* Since the above was written two other instances have come to my knowledge of trees in Canada being infested with San José Scale, and samples have been received and examined. One infestation is at Chatham, Ont., the other at Niagara, Ont. Every care is being taken in both places, to eradicate this serious enemy of the fruit grower.—J. F.

Remedy.—A very complete series of experiments was conducted, not only at Washington, but also in many other parts of the Eastern United States, in which every material known as an insecticide for scale insects was tried, and Dr. Howard's final conclusions are now of value to us. He says: "With the San José Scale the most satisfactory work can be done only with a winter wash; for this species may be found in various stages of development at any time through the summer months, and an emulsion spray at any given time will kill only a small proportion. Moreover, the young larva of the San José Scale settles almost at once and immediately begins secreting a dense scale which after 48 hours is practically impervious to the ordinary emulsion diluted so as not to injure the foliage."

As stated above, the only satisfactory treatment for this insect is a winter wash, and the question naturally arises. Which is the best? Dr Howard answers this for us: "But one absolutely satisfactory winter wash has been found. This is whale-oil soap (not containing more than 20 per cent of water) a pound and a half or two pounds to a gallon of water. This mixture killed every insect upon the trees to which it was applied, as was proved by a very thorough examination. Good whale-oil soap can hardly be bought for less than four cents a pound by the barrel, and this makes a thorough winter treatment an expensive matter. The best recommendation that can be made from the present outlook, however, is to use this mixture soon after the leaves fall in the autumn, and then, if examination reveals any survivors, to repeat it shortly before the buds open in spring."

The San José Scale is one of the most injurious insects which have been found on fruit trees, and, should it be allowed to establish itself in our Canadian orchards, it will be the cause of great loss to our fruit growers. It is, therefore, imperative that all should exercise the utmost care in examining their trees if they have been lately imported, and in buying trees only from nurserymen whose stock is known to be free of infestation. The home-grown trees of all of our Canadian nurseries are certainly much safer in this respect than those of any in the United States.

The San José Scale is a small flat scale insect, only about $\frac{1}{16}$ of an inch in diameter and so hard to detect on the bark of trees that it can hardly be recognized without a magnifying glass. The best indication of its presence is the dirty grayish appearance of the bark as if ashes had been dusted over the trees.

The PLUM CURCULIO (*Conotrachelus nenuphar*, Hbst.).—Many reports from all parts of Eastern Canada referred to the Plum Curculio as abundant, but the injury was not appreciable this year, owing to the enormous crop. Mr. L. Wolverton says: "The Plum Curculio has not been quite as troublesome this season, perhaps because of the abundant crop in this section, which made its attacks less noticeable." Mr. S. C. Parker, of Berwick, N.S., also says: "The Plum Curculios were plentiful, but could not destroy enough to lessen materially the enormous crop of plums. Some of our plum growers pick up carefully all the dropped plums, and claim that they can thereby keep their plum orchards free from the Curculio."

The GRAPE PHYLLOXERA (*Phylloxera vastatrix*, Planch.).—This insect, so well known by name from its enormous injuries to the vineyards in Europe, is seldom the cause of serious injury in Canada. It, however, attracted much attention in the Grimsby district last summer. Mr. Wolverton reported it as "unusually abundant on the leaves of grape vines throughout this district. In many cases hundreds of vines on one plantation had their foliage covered with the galls of this louse. I examined some sections of these galls under the microscope and could see great numbers of the eggs and several fully developed insects. I have not recommended any special remedy, because I note what you say that the Phylloxera is not to be looked upon as an important enemy in our Canadian vineyards, as, although a native, it has not in the past caused serious loss. I have never observed any of the variety which affects the roots, nor have I had any one report it to me."

The PEACH-BARK BORER (*Phlœotribus liminaris*, Harris).—I have referred in previous reports to the extensive injuries due to this minute insect in the peach orchards of the Niagara district, and also to some successful experiments carried out by Mr. Carl E. Fisher, of Queenston, Ont., with an alkaline wash, to which Paris green, lime and

carbolic acid were added. This wash has been again used successfully during the past season by Mr. Fisher, who writes: "The last wash I used for the Peach Bark beetle was the dead shot remedy. Every tree it was tried on is free from the little beetles." This remedy is applicable for many other bark-boring beetles, such as the Shot-borer of the apple and plum. The formula, as last used by Mr. Fisher, is as follows:—

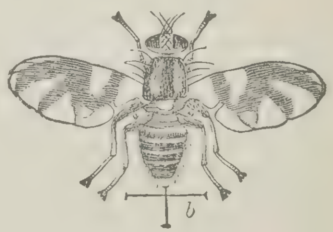
Washing soda, 5 pounds; soft soap, 3 quarts (or hard soap, 3 pounds); water to make 6 gallons; air-slaked lime sufficient to give the mixture the consistency of thick paint; finally, add 4 ounces of Paris green and 1 ounce of carbolic acid. To be applied with a whitewash brush, thoroughly covering the trunk of the tree and a few inches up the limbs. The first application should be made as soon as the beetles appear in the spring, sometimes as early as the middle of March. Two or perhaps three applications, a month apart, may be necessary.

The Black Peach Aphis (*Aphis persicæ-niger*, E. F. Smith).—Letters from Essex County and a single one from St. Catharines show that a good deal of injury is being caused in young peach orchards by the Black Peach Aphis. Up to the present no satisfactory remedy has been applied, but experiments have been arranged to be carried out next season. The application of kainit, as advised by Prof. J. B. Smith and mentioned in my last report, is specially commended to the attention of peach growers. Prof. Smith says: "In our State, on light soil I advise about 10 pounds of kainit per tree, covering the probable extent of the root system—this for a tree 4 to 6 inches in diameter and in bearing—the application to be made in spring, when the trees are leafing out. In our orchards the kainit has proved successful wherever used. Dr. Erwin F. Smith recommends ground tobacco, and so does Prof. Alwood, of Virginia."

THE APPLE MAGGOT.

(*Trypeta pomonella*, Walsh.)

Infested Apple.



Perfect fly.

Fig. 15.—Apple Maggot.

Attack.—Slender, white or greenish white footless maggots; when full-grown, about $\frac{1}{4}$ of an inch in length by $\frac{1}{15}$ of an inch in width, tapering gradually to the head and cut off abruptly behind; burrowing in all directions through the flesh of apples, feeding upon the pulp and leaving brown channels. There are sometimes as many as a dozen maggots in a single apple, but one is enough to render it worthless. The eggs are inserted beneath the skin of the fruit by a two-winged fly with a sharp ovipositor. The young maggots which hatch from these become full-grown in about six weeks, causing the fruit to ripen prematurely and drop to the ground, when the maggots work their way out and entering the soil a short distance, change to pale coloured puparia, inside which the maggots remain unchanged until the following spring. The pupa state is assumed only a few days before the perfect insects appear.

The fly of the Apple Maggot (Fig. 15, *b*) is a pretty little insect described as follows by Prof. Harvey, of Maine, who published a most complete study of this pest in the "*Annual Report of the Maine State College* for 1889": "The perfect insect is a two-winged fly somewhat smaller than the house-fly, readily recognized by its general black colour; yellowish head and legs; dark feet; greenish prominent eyes; white spot on the back and upper part of the thorax; three white bands across the abdomen of the male and four across the abdomen of the female, and four black bands across the wings, resembling the outline of a turkey."

The injury done to the apple crop by the Apple Maggot in the states of New York, Massachusetts, Connecticut and Vermont are well known, but, outside of these States, although the insect is common and feeds in the larval form upon the fruit of the hawthorn (*Cratægus*) over a large area of country, there is no record of its having attacked cultivated apples to any appreciable extent. During the past summer, however, infested apples were received from Dr. D. Young, of Adolphustown, Lennox Co., Ont., north of Lake Ontario, with the following letter, which is the first record of its injurious occurrence in Canada:—

"Adolphustown, 31st October.—I send you apples injured by worms of some kind from a tree that heretofore always produced very clean and smooth fruit. Kindly tell me what the worm is and what remedy to apply. I spread round the trees which bore the infested fruit ten or twelve wagon loads of barn-yard manure in the spring of 1895 and again in 1896. I fear this may have enticed the insect. What gives me this idea is that I have two trees, a Golden Russet and a Winesap, that always produced clean fruit till we put a pig pen and yard right between them, the roots running under the pen and yard where the soil is immensely rich. Since the pigs were kept there, the fruit on these two trees has been very poor, and this year was entirely worthless on the Golden Russet. Although heavily loaded, there was not on the tree one good apple, and the Winesap was nearly as bad. It was heavily loaded too, but I think not one in fifty was good for anything. Yet the apples on the other Golden Russet and Winesap trees near by were very fine."—Dr. D. Young.

A little later Dr. Young sent me a good supply of infested apples, with the statement that the maggots were working in other varieties than those mentioned. No living maggots were found in these, but two dead specimens served to identify the species in confirmation of the opinion formed from the very characteristic work of the larvæ in the fruit.

There is only one brood of this insect, but the eggs are laid by the females during a very long period, namely, from the beginning of July till frost sets in. The flies, which are produced from early ripening varieties of apples, appearing at a correspondingly early season the following year, and those from late varieties lay the eggs which produce the maggots found in the stored apples during the winter. Prof. Harvey says: "We have never seen the exit holes in hanging fruit, and believe the maggots do not drop, but go into the ground from the fallen fruit. Their presence causes the fruit to mature earlier. Fruit picked from the tree may contain larvæ, and often stored or marketed fruit is alive with maggots. Apples apparently sound when gathered may, by the presence of eggs or young larvæ, afterwards become hopelessly involved. The development of the maggot is slower in late and hard fruits."

When infested fruit is stored, the maggots emerge as they become full-grown and turn to puparia inside the barrels or bins.

Remedies.—As the egg of this insect is laid beneath the skin of the apple, it is evident that spraying with poisonous applications would be useless. The remedy which is most relied on by those who have had experience with the insect, is the prompt destruction of windfalls, so as to prevent the maggots going into the ground. This can be done by keeping a sufficient number of pigs, sheep or other stock in the orchard. If this is inconvenient, the more expensive operation of collecting by hand and destroying or feeding to stock must be rigorously practised if this pest is to be controlled. The refuse from bins or barrels should, of course, also be dealt with in some way to prevent the insects coming to maturity. Prof. Harvey says emphatically: "The gathering of windfalls for the express purpose of checking *Trypeta* has been tried and found effectual. We firmly believe we have in the careful destruction of the windfalls, the means of

destroying the pest. If windfalls are left lying in an orchard, the maggots will leave them and enter the ground; but they always remain near the surface, so that deep spading or ploughing would bury most of them so deeply that the flies would be unable to emerge. A most useful practice also is the penning up of poultry beneath infested trees; these will scratch out and devour large numbers of the insects."

It is hardly likely that the flies were attracted by the odour of the manure applied by Dr. Young to some of his trees or by the pig-pen beneath others, but the observation is well worthy of being remembered in case the Apple Maggot spreads and becomes more destructive in Canada. A characteristic of the occurrence of this insect is its slowness in spreading from one locality to another, from orchard to orchard, or even from variety to variety and from tree to tree in an orchard. It is said to be largely confined to sheltered locations and sandy soils.

THE APPLE FRUIT-MINER.

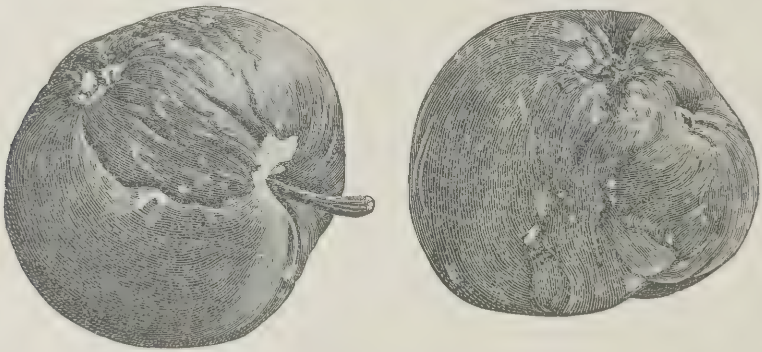


Fig. 16.—Apples injured by Apple Fruit-miner.

Attack.—Small caterpillars tunnelling in all directions through the flesh of apples, discolouring them and rendering the fruit unfit for use; when full-grown, they are a little over a quarter of an inch in length, dirty white in colour, tinged with pink just before spinning their cocoons. Head and a small shield at the end of the body, dark brown, somewhat resembling the caterpillar of the Codling Moth, but only about half its size when full-grown, and with the body much more tapering to each end. When ready to spin up, these caterpillars leave the fruit and make cocoons which in nature are probably placed in crevices of the bark in the same way as those of the Codling Moth.

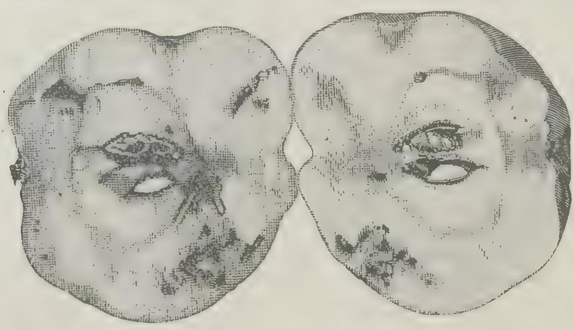


Fig. 17.—Apple injured by Apple Fruit-miner (inside).

Nothing is known of the egg-laying habits of the moth from which the caterpillars spring, but, from the appearance of the infested fruit at the entrance of the tunnels, it would appear possible that the young caterpillar may live at first for a short time on the foliage or beneath a leaf attached by it to the fruit. A point of entry is frequently marked by several very small tunnels opening over the surface of a comparatively large area one-eighth of an inch to one-quarter of an inch in diameter, as if the insect had fed

there for some time. With the growth of the fruit, this point becomes the centre of one of several—sometimes 3 or 4 on a single apple—conspicuous depressions, by which the apples are much distorted; the blackened skin at the botton of these depressions is also frequently further discoloured by a white deposit, probably consisting of dried-up juice from the apple, which has oozed from the wound.

This is a most serious enemy of the apple grower on the Pacific coast, and it is to be hoped that every effort will be made next June to discover the method of egg-laying and the early habits of the young caterpillar. As the injury is done chiefly inside the fruit where the insect cannot be reached, it is probable that any practical active remedy will require to be applied at or soon after the time the eggs are laid.

It is strange that this insect, which injures the fruit of the apple in such a very similar way to that of the Apple Maggot (*Trypeta pomonella*, Walsh), should have broken out in British Columbia just at the same time as the latter insect was discovered in Ontario as a pest of cultivated apples.

It is probable that both of these insects are native species which are abundant in their wild food plants, the Apple Maggot in the fruit of hawthorn, and the Apple Fruit-miner in the wild crab (*Pirus rivularis*, Dougl.), and that the habit of attacking cultivated apples is exceptional with both; but, as *Trypeta* has shown that when once this bad habit is acquired it is very persistent although local, no effort should be spared to to find out as soon as possible with regard to this new enemy, all that can be known of its life habits, so as to arrive at a remedy.

As far as reports have been received, the injuries of this insect have not been noticed in the interior of British Columbia. Mr. Thomas G. Earl, the owner of a beautiful orchard at Lytton, on the Fraser River, just within the limits of the arid climate which characterizes the Interior Plateau of the province, says:—"I am happy to say I am not troubled with the worm you mention. I have seen it at Chilliwack and Agassiz."

The following interesting letters will show the serious nature of this new pest, and also give all that is actually known of the life history:—

"Victoria, B.C., July 17.—I send two specimens of infested apples forwarded to me from Chilliwack. Can you let me know what has caused the injury?"—R. M. Palmer.

"Victoria, B.C., Aug. 20.—Mr. Gibson has been looking after a number of specimens of the apple caterpillars from Chilliwack, and has succeeded in getting some cocoons. I hardly think the moths will emerge till spring."—R. M. Palmer.

"Agassiz, B.C., Aug. 12.—I send you, under another cover, some apples infested with a worm. This appears to be very prevalent in some districts in British Columbia this year. I noticed a few cases in previous years, but these were so few that I did not trouble about them, but this year it is a pest."—Thos. A. Sharpe.

"Spence's Bridge, B.C., Sept. 15.—I collected another box of apples infested with that new pest and have mailed them to you from Agassiz. I spent last Friday in Victoria, most of the time in the Department of Agriculture and with Mr. Anderson at his house. Mr. Anderson's assistant showed me several of the cocoons of this new pest in the apple, which seems to me to be much more injurious than the Codling Moth. It is a lepidopterous insect which, judging from the larva and cocoons I have seen, is about half the size of the Codling Worm. The cocoons are closely spun inside, with an outer covering of whitish silk of a neat and open pattern. The larva, as you will see, eats channels all through the flesh of the fruit, completely spoiling the apple for use. At the Department of Agriculture here the cocoons had been obtained by putting the apples uncut into a large glass jar and tying it over with gauze. As the larvæ matures, it finds its way out and spins its cocoons at the sides of the bottom of the jar."—Dr. Wm. Saunders.

"Agassiz, B.C.—I sprayed when the blossoms had fallen and once when the fruit was as large as a small crab. I dealt effectually with the caterpillar, and if Paris green were a remedy for this pest, I should have expected it to be killed at the same time, but it was not, or at least there were a great many left. I gathered a number of apples that I knew were infested and put them in a glass jar, covering it with thin muslin. I also mounted specimens, but have found out nothing definite. Of some varieties of apples, such as St. Lawrence, Wellington, American Pippin, Stark, Maiden's Blush and Fall Pippin, more than half the crop was injured. Other varieties suffered less, though to a considerable extent; and some varieties, like Winter St. Lawrence, Salome, Mann,

Yellow Bellflower, Scott's Winter and Sutton Beauty, were practically uninjured. I hear from some purchasers that many apples sold are injured by the maggot, which goes to show that in some cases at least they are taking no care for next year, as in late picked specimens I found very few worms, but evidence of their having been in the fruit."—THOS. A. SHARPE.

"Victoria, B.C., Dec. 10.—Your valued favour of the 30th ult. to hand and contents noted. In reply *re* Apple Fruit-miner, Mr. E. A. C. Gibson has been making a special study of this pest, and any information or specimens which I have obtained have been turned over to him. As I know he intends sending you a full account of his work, I do not wish to anticipate him, so will only say that the insect has been specially destructive in the Chilliwack valley, and in the Mission City and Agassiz districts, but to a lesser extent is widely distributed in the lower part of the province, as I have received or observed specimens and their injuries at Ladner's Landing, Victoria, Cowichan and the Islands, as well as the lower Fraser valley. I am of opinion that it is a native insect. Its proper food is the fruit of the native crab apple. This Mr. Gibson's observations will determine."—R. M. PALMER.

"Victoria, B.C., Dec. 11.—I remember having seen these insects in the native crabs for a long time, but apparently they did not attack cultivated apples until recently, or if they did it was not noticeable. At Chilliwack, however, last summer I saw the effects of their ravages on the orchards of that place."—J. R. ANDERSON.

"Victoria, B.C., Dec. 16.—This insect has certainly occurred and been noted before this year, but I do not think it has till now caused any material damage. I secured most of my infested fruit from Mr. Kipp, of Chilliwack, who says: 'It is general throughout the upper end of my district,* and I noticed it at Agassiz as well on August 8th.' Mr. Kipp also says, in answer to some questions I addressed to him: 'I noticed it first about June 20th, found the worm, which was very small at that time, with blackish head, the other extremity the same, the body the same colour as the flesh of the apple (Gravenstein). Later in August the worm was about one-eight of an inch long; body, brown. I found worms from time to time through September. In October I could find no more worms, but late in October or about the first of November hundreds of small moths (white) were flying about mostly all day. Gravenstein, Ben Davis, Russets, Baldwin (slightly), Lady's Sweet, and various other varieties I cannot name, were attacked. * * * Seventy-five per cent of my fruit was affected.' I myself have received specimens of fruit attacked by this insect from Hornby Island as well as Chilliwack. I am sending you by the present opportunity under separate cover specimens of wild crab apples which have been altogether spoilt, as I think, by this same insect, and a piece of an apple, inside which I found the cocoon, which you say you would like to have. I found cocoons in several others as well."—E. A. CAREW-GIBSON.

Mr. Carew-Gibson has also kindly prepared the following interesting note on the subject:—

"NOTE ON A NEW APPLE FRUIT PEST IN BRITISH COLUMBIA.

"The new apple pest which has this summer more strongly forced itself upon our notice than previously, owing to the loss it has occasioned to the fruit crop in some parts of this province, is, I believe, an indigenous insect, as I have traced it back to what I believe is its original home, *i.e.*, the wild crab apple swamps. In the larval stage this insect is very small, when full-grown only measuring a quarter of an inch in length. The larvæ are of a dullish white colour tinged with brownish green, excepting the head, a broken line on the top of the first segment, thoracic feet and last segment with hind pro-legs, all brown. These larvæ diminish in size towards their extremities and can in this way be easily distinguished from the larvæ of the Codling Moth, which, besides, are very much larger when full-grown. A nearly full-grown larva on being caged on the flesh of a freshly cut apple soon disappeared from view; it started by chewing the apple pulp till it had a large mouthful, when it drew back its head from the hole thus made and disgorged the pulp, thereby giving the body room to get farther into the apple, this

* A rich district on the Fraser River extending from Sumas Lake to Popcum, a distance of about 20 miles, with the town of Chilliwack on the Fraser River situated almost centrally.

operation was repeated continuously and the insect was buried out of sight when looked for eighteen hours later. The larvæ apparently enter the fruit from the side, and eat their way into the interior by tunnelling the fruit in all directions. They sometimes reach the core and feed on the apple pips, but more often keep to the more fleshy part of the fruit, which is thus entirely spoilt, as the passages made by these insects soon turn brown and start decay throughout the fruit. When fully grown the larva emerges at the side of the fruit, and probably lowers itself to the ground before spinning up. I judge this to be the case, as by holding the spinning thread of a fully grown larva which had just emerged from the fruit I induced it to lower itself by its thread over six feet. It then spins a very beautiful white cocoon of an open-work pattern, and inside and separate from this, it spins another close-fitting white covering. These cocoons measure about three-eighths of an inch long. I have found cocoons of this insect spun up inside the core of several apples. It will be easily seen, however, that this is only possible in the more open cored varieties of fruit, and the chances of survival are very slight for those following this plan. I have specimens of this insect which spun up as early as August 6th, and also had samples of fruit containing larvæ apparently not full-grown on November 9th. The only sign that the fruit is infested at an early stage of its attack is by the exudation of juice from the fruit at the point where the insect entered, which generally dries up in the form of a little bubble; later, when the larva has left, the small hole in the side of the fruit through which it escapes can be readily seen on a close examination. The rotting of the fruit along the passages made by this insect may be caused by spores of fungi lodging where the apple skin is pierced, and thereby decay working its way along the open passages. My reason for thinking that this insect is indigenous is because I have several cocoons from infested fruit of wild crab apple trees. I have often in previous years noticed that a great deal of the fruit of the wild crab apples is completely spoilt, and have arrived at the conclusion that it is our new enemy which is responsible for the damage. I took some infested wild crab apple fruit and placed it in a jar on September 13th, and on September 25th I had three nicely spun cocoons in the bottom of the jar. The wild crab apple fruit which is affected, when ripe, turns quite black, instead of being of the ordinary brown colour, and one sometimes sees a whole tree with scarcely a sound berry on it."—E. A. CAREW-GIBSON.

The fruit of *Pirus rivularis* is borne in bunches of about a dozen together on slender stalks over an inch in length; each individual fruit is a small, berry like, ovate, oblong pome, about half an inch in length by three-eighths in width.

Besides the above insects, there are some other caterpillars which injure apples, the life histories of which require working out, owing to the possibility of their becoming of economic importance. At Victoria in 1895 I found specimens of a small caterpillar feeding on the surface of the fruit, particularly at the calyx end eating the skin and mining a short distance beneath it; very similar larvæ were also received during the past summer from Mr. C. P. Newman, of Lachine Locks, Que., but some of these worked entirely beneath the skin, making large blotch mines, but not running nearly so deeply into the flesh as the British Columbian Apple Fruit-miner.

Mr. Palmer says as follows on the subject of the insect enemies of fruit in British Columbia: "The Codling Moth has been reported from several places, but after careful examination of infested or damaged specimens of fruit, I have failed up to the present to find the true Codling Moth. Still considerable damage was caused by worms in apples (distinct from the Apple Fruit-miner) of two or more different species and I hope with Mr. Gibson's aid and your special knowledge that we shall be able next season to determine what the pests actually are (as by that time we ought to have specimens of the perfect insects) and the proper methods of dealing with them."—R. M. PALMER.

As up to the present, owing to the energy of the provincial Department of Agriculture of British Columbia, the Codling Moth has been prevented from being introduced, as far as can be learnt, into that province, and, as larvæ of the Apple Fruit-miner have been mistaken for those of the Codling Moth and its work for that of the Apple Maggot, it may be well to point out some of the important characters in which these three insects differ. There should be no trouble in distinguishing them in all their stages

The Apple Fruit-miner and the Apple Maggot injure apples in a very similar manner, tunnelling the pulp of the fruit in every direction, leaving brown coloured channels with here and there rather large chambers. The injury of the former is generally rather less extensive than that of the latter.

The two insects, however, are quite different in appearance: the Apple Maggot is as its name implies a footless maggot which changes beneath the surface of the ground to a smooth whitish puparium, inside which it remains unchanged until the following spring; while on the other hand, the Apple Fruit-miner is a caterpillar with a distinct head, three pairs of thoracic feet on the segments next to the head, four pairs of short fleshy pro-legs under the middle segments and a similar pair of pro-legs at the end of the body. This turns to a chrysalis in autumn inside a close white cocoon which further is surrounded by an outer web or loose net work of white silk.

The Codling Moth, again, differs as to its work from both of the above. Instead of tunnelling in all directions through the flesh and destroying the whole apple, the caterpillar always works to the core and feeds upon the seeds, in most cases entering the fruit from the calyx end, and emerges through a hole straight from the core to one side. The larvæ of the Apple Fruit-miner and of the Codling Moth are both caterpillars, but that of the Codling Moth when full-grown is nearly three times the size of the Apple Fruit-miner, and is spotted with black, bristle-bearing points. The cocoons, too, are very unlike; while that of the Apple Fruit-miner is one-quarter of an inch long and surrounded by a white, lace-like outer netting, that of the Codling Moth is half an inch long and brown and close, with many particles of the bark upon which it is spun worked into it.

Specimens of the Apple Fruit-miner confined in a jar upon moist earth and with pieces of bark, invariably chose the latter to spin upon, the cocoons being generally placed deep in a crevice or under a flake of bark.

Remedy.—Until more is known of the habits of this insect, it would not be wise to make more than general suggestions as to a remedy. Mr. Sharpe mentions that he sprayed his trees for caterpillars, and that the fruit was badly infested on trees so treated, but no comparison is drawn with trees that were not sprayed. From so much of the life history as is known, spraying with Paris green, lime and water, in the same manner as for the Codling Moth, soon after the flowers fall, with two or three applications a week apart later, would seem to be the most reasonable method, and certainly would, at any rate, have the great advantage of destroying several other kinds of biting insects.

Description of caterpillar of the Apple Fruit-miner from Chilliwack, B.C., made August 3, 1896, after it had emerged from apple:—

Nearly cylindrical, slender, almost three-eighths of an inch long when extended, by $\frac{1}{16}$ in diameter. Head small, fuscous. Thoracic shield fuscous, with a white stripe in centre. Anal plate conspicuous, and on the anterior half of segment 13 is a long, narrow chitinous blotch, similar to the anal shield and probably representing the expanded bases of tubercles. Body whitish, washed all over with pink; bristles white and slender; spiracles inconspicuous; surface of the body uneven; intrasegmental folds deep, as also a median transversal fold on each segment. There is a row of deep depressions above and below the stigmatal fold.

When received on July 24, 1896, the above larva was white in general colour, with black head and thoracic feet. Two larvæ spun on 4th and 5th of August.

A cocoon crushed by accident on October 31 showed that the pupal stage had been assumed. The cocoon is double, consisting of a close, dense, white, spindle-shaped inside cocoon, one-quarter of an inch in length, inclosed in a loose bag of open network of large meshes; this is three-eighths of an inch by one-eighth. The inside cocoon is apparently open at one end, for, although no opening can be seen, in nearly every instance the larval skin and head are pushed out into the outer cocoon.

THE HORN-FLY.

(*Hæmatobia serrata*, Rob.-Desv.)

The invasion of Canada by this pernicious insect was first noticed in 1892, and every year since that date losses from the irritating bites of the Horn-fly have been complained of by cattle owners in some new parts of the country. The hope expressed in my annual report for 1893 that the numbers of the flies would after two or three years become less and less in any invaded district, has, to a large measure, been realized. In the province of Ontario, where the first Canadian specimens of the Horn-fly were noticed, there is a decided diminution of the numbers of this pest. Among answers to the questions sent out by Prof. Panton of Guelph, to farmers in different parts of the province, 25 reports were received of its increase and 46 of its decrease, and 25 correspondents noticed no change in the numbers. The following extracts are also of interest :—

"London, Ont., Dec. 7.—The Horn-fly was very conspicuous in its season, but the alarm concerning it seems to have abated."—J. Dearness.

"Sackville, Westmoreland Co., N.B., July 13.—I mail to your address under separate cover several specimens of a very troublesome fly known here as the Horn-fly. They gather in large clusters about the base of the horns and around the root of the tail, also under the flanks. They are evidently the cause of a very decided decrease in the flow of milk among the cows of this place. If you have a remedy for them, please let me know as soon as possible."—John L. Fawcett.

"Pointe de Bute, Westmoreland Co., N.B.—The Horn-fly was not quite so troublesome to the cattle this year in New Brunswick as last, but for several weeks was very active. Very little was done to protect the cows. The impression is growing that the fly will disappear in a short time."—Howard Trueman.

"Yarmouth, N.S.—The prescription I used for the Horn-fly was taken from the *Country Gentleman* :—'Take equal parts of lard and coal oil with a few drops of carbolic acid, and apply every few days as needed.' Any soft grease may be used instead of lard. I observed drinking at a public fountain near my place two yokes of oxen, the bodies of one yoke covered with thousands of these flies, while the others were entirely free from them. 'What do you use for the Horn-fly?' I asked from the driver of the former yoke. 'Fish oil,' was the reply. Whale oil soap would, no doubt, be effective. Along the sea coast fish oil is cheap and easily procured, and it is probably more durable than coal oil and grease."—Charles E. Brown.

"Berwick, King's Co., N.S.—The Horn-fly was very abundant. I found an English sheep dip (E. Liddle & Co.'s., I think.) applied to the cows with a brush about once in three days the cheapest and best preventive I have yet tried."—S. C. Parker.

"Sydney Mines, Cape Breton Co., N.S.—The Horn-fly was not nearly so numerous nor blood-thirsty as last year, and I hope will disappear in a year or two."—David G. Crawford.

"Glace Bay, Cape Breton, N.S.—The Horn-fly continues to give us some trouble, but not quite as much as at first. Various methods are adopted to defeat them, all fairly successful."—Jas. W. Edwards.

"Charlottetown, P.E.I.—The Horn-fly did a great deal of damage here during the summer of 1895. I think a reasonable estimate for milch cows would be about one-sixth shrinkage in the milk flow, and fattening cattle did not do well. Last season (1896) they were not nearly so bad. I hope they have had their day and will not show up in the spring."—Thos. J. Dillon.

"Alberton, P.E.I.—The Horn-fly was, many say, as bad as last year. My own personal observation points to a decrease, but others say to the contrary. Our farmers are at a loss for a cheap effective remedy. Kerosene emulsion, fish oil, vegetable oils are all ineffectual to completely keep off the pest."—Rev. A. E. Burke.

Remedies.—There is nothing new to record in the way of remedies. As previously stated (*Experimental Farm Report*, 1893, page 186), almost any greasy substance rubbed on the animals will keep the flies away for several days. A number of experiments were tried in the field with the result that train oil alone and train oil or lard

with a little sulphur, oil of tar or carbolic acid added, will keep the flies away for from three to six days, while with a small proportion of carbolic acid it will have a healing effect upon any sores which may have formed. Train oil or fish oil seem to be more lasting in their effects than any others experimented with.

The safest and most convenient way of using carbolic acid is in the shape of carbolized oil, which can be prepared by dissolving one ounce of crystallized or liquefied carbolic acid in 1 quart of oil. Train oil, fish oil, tanner's oil, olive oil or any other fixed oil will answer ; but not coal oil, as carbolic acid is not soluble in this liquid. The crude carbolic acid does not dissolve easily in fixed oils, and, therefore, must not be used. Instances have been reported to me of injury to animals and the hands of operators, when the crude has been substituted for the purer form of carbolic acid.

Mr. Robert Elliott, the herdsman at the Central Experimental Farm, finds that the most convenient mixture which is effectual is 10 pounds of lard mixed with one pound of pine tar.

THE APIARY.

The practical management of the Apiary during the past season, as heretofore, has been satisfactorily carried on by Mr. John Fixter, the farm foreman. Mr. Fixter has been of great service in showing visitors over the bee-yard and explaining all matters connected with bee-keeping when consulted. All details with regard to this branch are given in Mr. Fixter's report appended hereto. Mr. Shutt has also kindly prepared a report in continuation of that of last year upon further experiments with different brands of "foundation," which I feel sure will be read with much interest by all bee-keepers.

In May last four colonies of thoroughbred Italian bees were purchased from Mr. M. B. Holmes, of Athens, Ont. Two of these were sent to the Experimental Farm at Brandon, Man., and one each to the farms for the North-west Territories and British Columbia. These bees were very beautifully marked, and the queens were all young imported stock, with the exception of one of those sent to Brandon, which was two years old, but also imported. The colonies all arrived at their destinations in good order, and will be found mentioned in the reports of the various branch farms.

I was much pleased to be able to arrange for a joint mid-summer meeting of the Bee-keepers' Associations of the counties of Russell, Prescott and Glengary. This meeting was held at the Central Experimental Farm on the 12th of June last, and was attended by many of the leading members of the various associations, who expressed themselves as much pleased with what we were able to show them of the work being done in the Apiary.

REPORT OF MR. JOHN FIXTER.

Experiments in Wintering (1895-96).

The experiments begun last year as explained in the report for 1895 were repeated this season and some others were undertaken. Following is a report on these :—

Experiment No. 1.—Seventeen colonies put into winter quarters in the cellar on the 20th of November, 1895. Empty hives were placed on the floor, with 3 inch blocks of wood on the top of them, at the back, and the hives piled up three tiers in height. In addition to the 3-inch blocks, by which the back was raised higher than the front, so as to give free ventilation, each hive was raised from its own bottom board with small blocks $\frac{3}{8}$ inch in height. All front entrances left wide open. The wooden covers of all these hives were removed and replaced by chaff cushions, four inches thick. Above the cushions strips of wood, one along each side, prevented them touching the bottom of the hive immediately above them, and also allowed air to circulate freely under each hive.

This mode of wintering was, on the whole, very successful. One swarm, however, died from an unknown cause. When put into the cellar it had plenty of honey and weighed 58 pounds. In spring its weight was found to be $47\frac{3}{4}$ pounds.

The average weight of the 16 other colonies was before winter $50\frac{1}{4}$ pounds, and in the spring $40\frac{1}{4}$ pounds, each colony having consumed an average of only 10 lbs. of their stores against 12 pounds 9 ounces the preceding winter, and 20 lbs. in 1894-95. During the winter scarcely any humming could be heard in the hives, and there was no sign of dampness nor of dysentery.

The product from the 16 hives during the season was, on an average, 47 sections of honey from each, besides 17 pounds. in "extracting-frames" reserved for winter and spring feeding. The 16 hives gave 5 new swarms.

Experiment No. 2.—Two colonies put into the cellar, with tops and bottoms of the hives left on, just as they were brought in out of the bee-yard. These were to be watched for dampness.

By the 30th December, some mould was noticed at the entrance of one hive, and a fortnight later both were very damp, one even had water on the bottom board. In this hive, however, the bees kept very quiet and scarcely any hum could be heard, while those of the other hive were very restless, some coming out at the entrance from 30th January; consequently, on 10th February, a little ventilation was provided by displacing somewhat the wooden cover; nevertheless, on 1st March, there were signs of dysentery, and about half a pint of dead bees was removed. By 16th March signs of dysentery appeared also on the other hive, and on the 1st April both seemed to be in a very bad condition, a considerable number of dead bees having to be removed from them.

On 15th April the two hives were taken out and placed on their summer stands; there were many dead bees and mould on the bottom board; but the colonies were still fairly strong. The bottom boards were removed and clean ones put in place of them.

On 27th April the hive that had been the quieter one during winter, was found deserted; its frames were very mouldy and soiled with fæces. The other hive, on the same date, had two frames partly filled with brood and with new honey. The product of this hive and of one swarm which it gave, was 92 sections of honey.

Experiment No. 3.—One colony was placed in a packing case in the cellar, on the 22nd November, 1895, and packed with four inches of dry sawdust all round the hive; brood chamber raised from bottom board by four small 1-inch blocks; wooden cover of hive replaced by a 4-inch chaff cushion, and the packing case filled up with four inches of dry saw-dust above the cushion. For ventilation a small shaft of the same size as the opening to the Langstroth hive, led from the opening of the hive to the outside of the packing case. Case placed on the top of another case, three feet high, in the stone cellar beneath dwelling house.

About the 21st of January, this colony began to be uneasy; some bees were coming out. On 30th January, the top was somewhat displaced to give ventilation; nevertheless bees kept coming out, though the cellar was perfectly dark, and on 14th February a piece of thin netting was placed over the entrance to stop them. On 1st March, there were many bees dead about the entrance which was much soiled with fæces. The number of dead bees then became less and less, and on 1st April the colony was perfectly quiet. On 15th April it was taken out of the cellar and found to be in a very weak condition with no more than one frame of bees; the other frames were much soiled with fæces. The weight of the hive, 55 pounds on 22nd November, was now reduced to 39 pounds, the bees having consequently consumed 16 pounds of honey.

On 1st May the bees though weak were gathering pollen actively; on 15th May the hive contained two frames with brood and much new honey, but no eggs and no queen. One queen cell only was capped. On 25th May, all the brood had emerged and flown away leaving scarcely a dozen bees in the hive. On 30th May, the hive was deserted, the queen cell not being uncapped; 7 pounds of fresh honey had been gathered into the brood chamber.

I am of the opinion that this colony perished from being kept too warm and for want of sufficient ventilation.

Experiment No. 4.—This experiment is very similar to the last, but no ventilation was provided, it having been claimed by one of our correspondents that he had always wintered bees satisfactorily in this way.

The bottom board of the hive was removed and the hive was stood on four blocks $1\frac{1}{2}$ inches high, one under each corner, placed right on the bottom of the packing case, which was then filled in with dry saw-dust, four inches all round and above, as in Experiment 3, except that no shaft for ventilation was cut through to the outside of the packing case; but immediately beneath the hive there was a narrow crack between the boards of the packing case, not $\frac{1}{16}$ of an inch wide. The packing case itself was raised about an inch off the earthen floor in the stone cellar by means of small blocks.

On 22nd November the hive weighed 49 pounds. No sound could be heard in it all winter. On 15th April the bees were found all dead on the bottom board and appeared to have died early in the winter, as scarcely any honey was consumed and the combs were dry and clean. Weight on 15th April, $47\frac{1}{4}$ pounds. It is plain that this plan cannot be recommended.

Experiment No. 5.—One colony was placed in a packing case large enough to allow of 4 inches of cut straw and chaff being packed all round the hive, and the box was left out of doors in a sheltered place on the ground in the yard. Bottom board loosened and 1-inch blocks put at each corner between bottom board and brood chamber. Wooden cover also replaced by 4-inch chaff cushion, and box filled up with 4 inches of chaff and cut straw. No ventilation.

The case was, besides, buried under a foot of snow shovelled upon it. No sound could be heard from this hive during the winter till it was taken out on 15th April; the weight had been reduced from 57 pounds in November to $49\frac{1}{4}$ pounds, the bees having consumed $7\frac{3}{4}$ pounds. On being taken out, the hive was found very wet and mouldy with a thickness of about two inches of dead bees on the bottom; two frames only were partly filled with bees. Water had evidently come in from the outside, which would have been avoided if the hive had been raised about one foot from the ground, and the results might then have been much better.

On 1st May the bees from this hive were gathering pollen, but were few in number. May 14:—Colony very weak, but queen apparently in good condition; two frames with brood and eggs and new honey. June 1:—Hive deserted, though plenty of stores remaining; $11\frac{1}{2}$ pounds of new honey in the brood chamber.

Experiment No. 6.—One colony packed exactly as No. 5, but with ventilating shaft from entrance to the outside of the case which was placed three feet from the ground on the top of an empty case out of doors.

No sound could be heard from this hive all winter up to the 1st April, when a slight hum was perceptible. On 8th April the first bees made their appearance, some flying in the evening; there were many dead bees at the entrance; outside temperature, 44° F. From the 8th to 14th April, on warm days, a few bees were noticed flying. On 15th April the hive was taken out of the packing case and found to be deserted; many dead bees lay at the back end of the hive; the frames above were all dry and clean.

The hive when put into the case on 22nd November, weighed 51 pounds; when taken out on 15th April, $39\frac{1}{4}$ pounds, $11\frac{3}{4}$ pounds of honey having been consumed.

Conclusions:—The mode of wintering that has given most satisfaction is No. 1.

Hives put in the cellar as they came from the bee-yard with the tops and bottoms on (No. 2), had not sufficient ventilation. Dampness caused dysentery.

In the hive packed in saw-dust with no ventilation (No. 4,) the bees were smothered: in the hive similarly treated but with ventilation (No. 3,) the colony was much weakened by heat, dampness and insufficient ventilation.

The hives packed in chaff and left out of doors, one on the ground without ventilation (No 5) and the other with a ventilating shaft (No. 6), seem to have both been

insufficiently protected with packing, but the former one probably suffered most from the water that found its way into the hive.

The temperature of the cellar during the winter 1895-96 was:—

November	38° to 40° F.
December	40° to 44° F.
January	38° to 44° F.
February	38° to 43° F.
March	40° to 41° F.
April	40° to 47° F.

Season of 1896.

April 13, 1896.—The weather being very fine, bright and calm (temperature in the cellar 42° F., out of doors, 55° to 59° F.), three hives were taken out of the cellar at noon and placed on their summer stands, which were set on about one foot of snow. The bees began to fly at once, but at night there was a considerable number of dead bees about the entrances.

" 14.—Weather very cool; very little flying.

" 15, 16.—Very warm, bees actively gathering pollen on willows in the swamps.

" 16.—Remaining colonies taken out. Temperature in cellar 47° F.; out of doors, 75° to 78° F.

" 16–30.—Bees working well, gathering pollen on willows and soft maples. Some bees seen attempting to rob; entrances of threatened hives were contracted so that only one bee could pass at a time.

May 1–7.—Bees gathering pollen. Two days were cold and windy; some dead brood was carried out before the entrance of the hive.

" 8–13.—Bees began to work on cherry and plum blossoms.

" 13.—Apple blossoms provide abundance of pollen and honey.

" 14.—Dandelions in full bloom and very attractive to bees.

" 15–20.—Very fine; bees working well.

" 20.—White flowers of *Viburnum Lantana* covered with bees gathering honey.

" 20–31.—Bees working well; buckthorn hedges (*Rhamnus frangula*) thronged with them. This, like the *Viburnum*, appears to be a very valuable shrub for bees, as it comes in bloom so early in the season, before the clovers. Both these shrubs, especially the buckthorn, make also good and useful hedges and can be grown from seed.

June 4.—Bees clustering for the first time. Removed all cushions and propolis quilts. Placed supers on all hives requiring them.

" 5.—Clover and Mock Orange (*Philadelphus*) beginning to bloom.

" 13.—First swarm of the season.

" 19.—Bee-moth grubs found in some of the hives, of which the colonies had died or deserted in the spring. These hives were taken into a closed room, and fumigated with sulphur. For this purpose the brood chambers, after removal of the top and bottom, were piled on the top of each other, and raised sufficiently from the floor to allow of an iron vessel standing on legs, containing half a pound of sulphur to be placed under the lowest; the sulphur was ignited, and the fumes rose through all the frames and killed every grub.

" 22.—Inspected every hive; a considerable number of sections were capped.

July 1.—First honey taken off from the hives this season.

" 3.—Noticed bees very thick on mustard and basswood, of which the blossoms are just opening. Marked all supers, and removed those that were full.

" 21.—Bees working still on clover and basswood, and beginning on the English horse-beans.

" 23.—Basswood blossoms just finished.

" 24.—Noticed bees abundantly attracted by the following flowering plants:— *Asclepias tuberosa*, *Aster sibiricus*, *Centaurea macrocephala*, *Linaria spectabilis*, *Veronica spicata*.

July 26.—Bees very thick on St. John's wort.
" 27.—Buckwheat plot No. 1 in bloom; bees working well.
Aug. 4.—Workers first noticed killing drones.
" 6-18.—Very hot and dry; this weather lessened the flow of buckwheat nectar considerably, so that the bees worked on this plant only early in the morning.
" 18-Sept. 1.—Weather very fine, with occasional showers; bees flying well, but no increase in weight of honey.
Sept. 1.—Removed all supers, and weighed brood chambers; all the hives of a weight less than 55 pounds were given extracting frames with good sealed stores, so that they might go into winter quarters weighing about 50 pounds. For this, the frames that were empty, or nearly empty, were taken out and replaced by full frames with well-capped honey. When it was not found advisable to replace the frames, but feeding was necessary, a super containing partly-filled sections, or extracting frames, was placed on the top on the propolis quilt, a corner only—about one inch—of the quilt being turned back to provide a passage for the bees, so as to make the bees believe they were taking the honey from another hive. It is important to uncap the whole of the sections or frames in the super, or the bees will not take the honey down to their own combs so readily. If this mode of feeding is followed, there is little danger of the bees robbing.

The above excellent plan of placing a quilt under the super, as explained above, was suggested to me by Mr. William McEvoy, of Woodburn, Ont., Foul Brood Inspector, and proved perfectly successful. This plan prevents robbing, and uses up any sections which may be only partially filled.

Those who have no extra sections or frames of honey should feed granulated sugar of the best quality, two parts, by measure, in water, one part. The water should first be boiled and then, while still on the stove, kept thoroughly stirred while the sugar is put in and until all is dissolved. This syrup is to be fed lukewarm, great care being taken not to allow any to leak or be spilt around in the hive. We generally use a Miller feeder.

Buckwheat.

Two plots of Silver-hulled buckwheat were sown last season on the Experimental Farm, primarily as pasturage for the bees, but also for the grain.

Plot No. 1.—The ground was partly sandy, partly clay loam. A dressing of wood ashes—about 150 bushels to the acre—was applied during the early part of the winter and ploughed under in spring. The buckwheat was sown on 20th June, three pecks to the acre. It came up 27th June, was in bloom 26th July, when the bees began at once to work on it; its growth was strong and even, and the seed was ripe on 25th September. A heavy frost on 22nd September injured this plot so that it was of no further use for the bees. Yield of threshed grain per acre, 29 bushels 26 lbs.

Plot No. 2.—Soil similar. Sown, 29th June; came up, 5th July; in bloom, 30th July and 1st August, when the bees began at once to work on it; it made a strong and even growth. It was injured by frost on 22nd September, and cut on 25th September. Yield of grain per acre, 23 bushels 32 lbs.

Five-Banded Italian Bees.

There is in the apiary but one colony of pure Five-banded Italian bees. It has again this year given very good returns. It was one of the colonies of the wintering experiment No. 1, and came out of winter quarters fairly strong, having consumed only 7½ pounds of honey. During the summer it made 20 sections of honey and 53 pounds of extracted honey, and swarmed once in July. A swarm from another hive, which came out at the same time, was very much mixed with this one, but the Italian queen came through safely. These two swarms together made 22 sections and 37½ pounds of extracted honey.

View of the Apiary at the Central Experimental Farm, Ottawa.

Hive in a Wood Shed.

Many inquiries having been received from the city, where space is scarce, about the possibility of keeping bees in sheds, we tried last season by placing one in a wood shed. A small hole, 6 inches by 6, was cut in the side wall of the shed, on a level with the floor, facing the south. The entrance of the hive was close to this. From 15th April to 1st May bees from other hives tried very hard to rob this hive; so the entrance was contracted so as to allow only one bee to pass in and out at a time. This hive and the swarm which it gave produced 93 sections of honey. This hive has been left in the shed for the winter. (See Experiments in wintering, 1896-97, No. 5.)

Hive Kept on Scales to Show Daily Gain.

Records of the daily weighing of one colony were kept during the summer. This was a first swarm secured on 13th June, and weighed at that date $6\frac{3}{4}$ pounds. It was put into a hive with four frames of drawn comb and four frames of foundation, placed alternately.

1st week	from 17th June,	gain	....	$22\frac{3}{4}$ lbs.	
2nd "	24th "	"	....	$20\frac{1}{2}$ "	
3rd "	1st July	"	....	$12\frac{1}{4}$ "	
4th "	8th "	"	....	$15\frac{3}{4}$ "	
5th "	15th "	"	....	$15\frac{1}{4}$ "	
6th "	22nd "	loss	....		$4\frac{1}{4}$ lbs.
7th "	29th "	gain	....		
8th "	5th August	"	....	$11\frac{3}{4}$ "	
9th "	12th "	loss	....		$\frac{1}{4}$ lb.
10th "	19th "	"	....		2 lbs.
11th "	26th "	"	....		1 lb.
				$98\frac{1}{4}$ lbs.	$7\frac{1}{2}$ lbs.

Making a total gain in weight of $90\frac{3}{4}$ pounds. Ninety-four sections of honey were taken from this hive. Some of the difference represents the weight of brood, &c.

The largest gain on any one day was $6\frac{1}{4}$ pounds, on two occasions, one during the clover flow and the other during the basswood flow.

Returns.

The total returns of the Central Farm Apiary for the season of 1896 show an average of 50 sections, and 16 pounds and $\frac{1}{2}$ ounce of extracted honey for each colony.

The Bee Cellar.

The winter quarters are a chamber boarded off from the cellar of a private house. In former winters, it was found to be too cold and damp and the ventilation was not satisfactory. There was only an upright ventilator, 3 inches by 3 inches, passing through the ceiling up to a stove pipe, and provided with a damper with which to regulate the draught; but no air could be let in from the outside.

Several important improvements have been made in this cellar during the last summer: a cement floor, shelves and an entrance from the outside. It is also larger than before, being 11 feet 6 inches by 15 feet, which allows 3 tiers of shelves above each other, and two passages. It is boarded off from the remainder of the cellar by a partition of tongued and grooved lumber. The floor is concrete over 8 inches of small stones. The lowest shelf is 18 inches from the floor, the second 20 inches clear above, and the third again 20 inches clear above that; neither the hives on the third shelf nor the uprights supporting the shelves reach the ceiling, so that no vibrations can reach the hives from the ceiling above.

Outside air can be let in at any time by slides into both the bee-chamber and the large cellar. Adjoining the bee-chamber is a smaller one provided with ventilators and having a coal stove, so that, whenever necessary, fire can be made to raise the temperature or purify the air of the whole cellar by increasing the ventilation.

Experiments in Wintering (1896–97).

Colonies put into winter quarters, 16th November, 1896.

No. 1.—A repetition of experiment No. 1 of the former winter, with 15 colonies of an average weight of 50 pounds and $15\frac{3}{4}$ ounces each.

No. 2.—A repetition of experiment No. 2 of former winter, with two colonies weighing respectively 49 pounds and 56 pounds.

No. 3.—Two colonies weighing $60\frac{1}{2}$ pounds and 63 pounds were placed in the root house of the Central Experimental Farm, which is 100 feet long, 25 feet wide and 10 feet deep. They are on a shelf nailed up against the side wall about 3 feet from the ceiling and projecting about 2 feet. A curtain is hung from the wall over the top and front of the hives, so as to keep out all the light. The propolis quilt of one of these hives had been removed on 2nd November and a cushion put in in its place. That of the other hive has been left and a cushion placed above it, but the front of the hives has been raised half an inch more by means of an inch block in the middle of the entrance.

No. 4.—Two colonies weighing 50 pounds and 52 pounds, have been put into a pit dug in the side of a hill 3 feet deep by 3 feet in width and 10 feet long, so that the ventilators at both ends should not be immediately above the hives which are in the middle of the pit. The hives rest on two cedar poles laid along the full length of the pit. A third cedar pole of the same length is laid in front of the entrance of the hives and insures the necessary circulation of the air from the ventilators. These ventilators which are 3 inches by 4, are made of boards, three of which reach down to the bottom of the pit, the fourth only to the top of the pit, and they rise 3 feet above the ground.

In each hive half-inch strips of wood have been laid under both sides and under the back end, between the brood chambers and the bottom boards, so as to provide more space at the bottom of the hive in case a quantity of dead bees should accumulate there.

The pit is filled up with loose straw up to four inches from the top, which is made of cedar poles along the length of the pit, the middle ones higher than the others, covered with a layer of straw and one foot of soil.

A small shaft has also been arranged between the hives, down which a thermometer can be let by means of a string, so that the temperature of the pit may be ascertained. The thermometer is examined once every week. If the temperature rises too much, some of the covering may be removed ; and if the contrary, some may be added.

No. 5.—Two colonies, weighing 54 pounds, and 63 pounds., were put in a wood shed, the walls of which are double-boarded, with an air space of four inches. The floor, which is about one foot from the ground, is also double-boarded, and there is no draught under it. The hives are about one foot from the wall, resting on a double thickness of sacks laid on the floor, and are covered above and all round with a double thickness of the same sacking. No ventilation is provided for one hive. For the other, which is the one that was kept in the shed during the summer, a small shaft, $\frac{1}{2}$-inch square, extends from the opening of the hive to the outside of the shed, and $\frac{1}{2}$-inch strips of wood are put under both sides and under the back end, between the bottom boards and the brood chambers, so as to give more space at the bottom of the hive in case a quantity of dead bees should accumulate there.

A Few Suggestions to Beginners in Apiculture.

Locate your bee-yard in a well sheltered place, where no cold wind can chill the brood. It will pay to build a high board fence if you cannot provide shelter in any other way.

Have no high trees near the apiary, for it is very difficult to get the swarms down from them.

Shade may be obtained by the use of a second cover to the hives, made of boards one foot wider and one and a half feet longer than the cover of the hive.

Do not use propolis quilts during the honey season.

Do not allow your sections to be travel-stained by leaving them in the hives too long; remove them to a warm room.

If the outside sections are not well filled, put them back in the next super.

Use 4-piece sections in preference to 1-piece sections.

Use full sheets of foundation in your sections: the bees will go up sooner and work better on full sheets.

In the same way, in the brood chamber use full sheets of foundation: this will be found a saving of time and do away with much drone comb.

Wire all brood frames and extracting frames.

Always sort your sections and clean them thoroughly before sending them to customers. Send them always in a clean super or in a neat crate.

Let the bees always have a supply of water as near as possible to the apiary, for in cool weather they require a great deal of water, especially when they are rearing a brood or if the honey flow is light.

Always handle your bees with the greatest care and gentleness.

JOHN FIXTER.

REPORT UPON FURTHER EXPERIMENTS WITH CERTAIN BRANDS OF COMB FOUNDATION, BY FRANK T. SHUTT, M.A., F.I.C., CHEMIST, DOMINION EXPERIMENTAL FARMS.

This investigation, commenced in 1894, and continued from year to year since that date, has for its chief object the determination of the relative usefulness in comb building of certain brands of "foundation." It was supposed that those brands of wax of which the bees used the most, or, in other words, to which they added the least amount of wax, in the building of the cell walls, would prove to have the greater value to the bee-keeper. It is argued by most practical bee-keepers that, in supplying the bees with wax that they can readily draw out and utilize in cell formation, a greater store of honey may be expected. This, indeed, seems to be the main reason for furnishing bees with artificial comb, though there are others of perhaps somewhat less importance. On the other hand, however, there are some bee-keepers who think that there is but little advantage in this respect, the chief benefit being a more regular structure of the cells in the section. At my suggestion, Mr. R. F. Holtermann, editor of the Canadian Bee Journal, has kindly furnished the following statement respecting the objects to be attained in supplying the bees with comb foundation:—

"As to the object of using comb foundation, brood foundation is used to save the bees time and material, to get all worker cells, and to secure straight comb. The foundation in the sections is first of all to aid in enticing bees into the supers, to save them material by the giving of wax, to save time, as they can begin storing more quickly in the supers; also to get an evenly-filled section, and to have it attached to the sides and bottom of section. Bees are much less likely to do this well when they build the comb themselves. Again, it is desirable to have the cells of a uniform size; by giving them the foundation, this is secured."

In connection with the question of wax utilization and deposition, Mr. Holtermann is also of the opinion that bees utilize the wax in the foundation to a greater extent when the honey flow is light; in other words, that, when gathering large quantities of honey, bees manufacture or produce more wax than when the honey supply is light. It might be urged that this argument, carried to its logical conclusion, would in a large measure go to show that, in seasons of a heavy honey flow, there is little economy in supplying foundation. In these considerations, the fact must not be lost sight of that wax is not a material gathered by the bees, but a true secretion, the result of the physiological functions of certain glands in the bee, and is produced to a large

extent at the cost of the honey consumed by the insect. Wax, is, therefore, in a sense, a physiological concomitant of honey, and consequently it is improbable that all the wax necessary for the construction of the comb can be furnished the bees; indeed, our past results all point in this direction. It is, however, at the same time true that a portion of this wax can be economically supplied in the foundation, and within certain limits it would appear that the wax added by the bees is inversely proportionate to that furnished as foundation. I am further inclined to the belief that the weight of the comb varies somewhat with the season: the reason for this may be accounted for by Mr. Holtermann's theory already referred to.

For the details of the method of procedure, the reader is referred to page 171, Report of the Experimental Farms for 1895. An additional experiment has, however, been made this year, namely, that of ascertaining directly the weight of foundation after it had been drawn out by the bees. This was done by carefully shaving away the empty cells on both sides till the foundation was left. The great difficulty experienced in doing this with any degree of accuracy, owing to inequalities and to the fact that the foundation is not always in one plane, renders the results but approximate. Indeed, it will only be from oft-repeated experiments in this matter that safe conclusions can be drawn.

In Table I, we present in detail the data showing the weight and percentage of wax added by the bees in building the comb:—

TABLE I.

EXPERIMENTS with various Brands of "Foundation," 1896.

Designating Letters.	Name of Wax and Mill.	Section.	Milling Temperature.	Weight in grammes of "Foundation," 2 inches square.	Weight in grammes of empty honey-combs, 2 in. square.	Weight in grammes of wax added by bees per 2 in. square.	Percentage of wax added by bees.	Gathered from
			F.					
A 1	Choice wax, Root mill..	Outer	89°	1·401	2·655	1·254	89·5	Clover.
A 2	" "	Inner	89°	1·401	2·735	1·334	95·2	"
B 1	" "	Outer	120°	1·204	2·691	1·487	123·5	"
B 2	" "	Inner	120°	1·204	2·647	1·443	119·9	"
C 1	Foundation in general use, 1896	Outer	.....	1·215	2·946	1·731	142·4	"
C 2	" " "	Inner	.....	1·215	3·003	1·788	147·1	"
D 1	" " 1895	Outer	.....	1·215	2·761	1·546	127·3	"
D 2	" " "	Inner	.....	1·215	2·700	1·485	122·2	"
D 3	" " "	Outer	.....	1·215	3·082	1·867	153·6	Buckwheat.
D 4	" " "	Inner	.....	1·215	3·182	1·967	161·9	"
E 1	Heavy sheet, Root mill	Outer	120°	1·315	3·062	1·747	132·8	Clover.
E 2	" "	Inner	120°	1·315	3·069	1·754	133·3	"
F 1	Inferior wax, Root mill	Outer	89°	1·224	2·823	1·599	130·6	"
F 2	" "	Inner	89°	1·224	2·771	1·547	126·3	"
G 1	" "	Outer	120°	1·167	2·664	1·497	128·2	"
G 2	" "	Inner	120°	1·167	2·666	1·499	128·4	"
H 1	Choice wax, Given process	Outer	.....	1·801	3·538	1·737	96·3	"
H 2	" "	Inner	.....	1·801	3·567	1·766	98·0	"
I 1	Poor wax, Given process	Outer	.....	1·582	3·739	2·157	136·3	"
I 2	" "	Inner	.....	1·582	3·771	2·189	138·3	"
J 1	Patent process, 12 sq. ft. per lb	Outer	.....	1·004	3·193	2·189	218·0	"
J 2	" " "	Inner	.....	1·004	3·311	2·307	229·7	"
K 1	" 15 sq. ft. per lb	Outer	.....	1·093	3·555	2·422	221·6	"
K 2	" " "	Inner	.....	1·093	3·329	2·236	204·6	"
L 1	Heavy sidewall, R. F. H.	Outer	.....	1·257	2·792	1·535	122·1	"
L 2	" "	Inner	.....	1·257	2·875	1·618	128·7	"

Although in some instances there would appear, comparing the above results with those of last year, to have been less wax added than in 1895, there are so many exceptions that no conclusions can be safely drawn, either as regards variation in weight of

wax deposited or its possible causes. The foundation supplied was from the same stock as that in previous years and consequently the same weight for the 2 inches square of foundation were used. The "percentage of wax added" by the bees, therefore, varies with the "weight of wax added".

The differences between the weights of wax added in the outer and inner sections is so small that the argument that the cell walls of the outer sections are stouter and heavier than those of the inner sections, receives no support from these data. This conclusion is practically identical with that reached in last year's experiments.

It is to be noted that in the case where very light foundations were used, as in *J* and *K*, the weight of wax added was much greater than when heavier brands were supplied.

As reported last year, the weight of wax added when the honey was collected from buckwheat is greater than in that deposited for clover honey.

With respect to the appearance of the comb from different brands of foundation, it was noticed as heretofore that the dark or deep yellow varieties produced unsightly "fishbones," which would materially affect the sale of the honey in the comb.

Since the chief object in this investigation was to ascertain the relative ease with which the wax of the various brands of foundation could be drawn out or utilized by the bees, and the above method of procedure not proving altogether satisfactory, it was thought that, at all events, approximate results could be obtained by weighing the foundation after the empty cells had been shaved away on both sides of the foundation, and subtracting the weight thus found from that of the same area of foundation as put into the section. The figure thus obtained would represent the weight of wax drawn out from the foundation supplied and utilized by the bees in building the cell walls.

The data in Table II, resulting from this method of experiment are:—

TABLE II.

EXPERIMENTS with various Brands of "Foundation," 1896.

Designating Letter.	Name of Wax and Mill.	Section.	Milling Temperature.	Weight in grammes of "Foundation," 2 inches square.	Weight in grammes of "Foundation" after removal of cells.	Weight in grammes of "Foundation" wax utilized by bees.	Percentage of "Foundation" wax utilized by bees.	Gathered from
			F.					
A 1	Choice wax, Root mill	Outer	89°	1·401	·702	·699	49·9	Clover.
A 2	" "	Inner	89°	1·401	·641	·760	54·2	"
B 1	" "	Outer	120°	1·204	·835	·369	30·6	"
B 2	" "	Inner	120°	1·204	·77	·434	36·0	"
C 1	Foundation in general use, 1896	Outer	......	1·215	·842	·373	31·0	"
C 2	" " "	Inner	......	1·215	·741	·474	39·0	"
D 1	" " 1895	Outer	......	1·215	·81	·405	33·3	"
D 2	" " "	Inner	......	1·215	·821	·394	32·4	"
D 3	" " "	Outer	......	1·215	·765	·450	37·0	Buckwheat.
D 4	" " "	Inner	......	1·215	·747	·468	38·5	"
E 1	Heavy sheet, Root mill	Outer	120°	1·315	·856	·459	34·8	Clover.
E 2	" "	Inner	120°	1·315	·900	·415	31·6	"
F 1	Inferior wax, Root mill	Outer	89°	1·224	·803	·421	34·4	"
F 2	" "	Inner	89°	1·224	·774	·450	36·8	"
G 1	" "	Outer	120°	1·167	·726	·441	37·8	"
G 2	" "	Inner	120°	1·167	·712	·455	38·9	"
H 1	Choice wax, Given process	Outer	......	1·801	1·187	·614	34·0	"
H 2	" "	Inner	......	1·801	·988	·813	45·1	"
I 1	Poor wax, Given process	Outer	......	1·582	1·107	·475	30·0	"
I 2	" "	Inner	......	1·582	1·135	·447	28·3	"
J 1	Patent process, 12 sq. ft. per lb.	Outer	......	1·004	·875	·129	12·8	"
J 2	" " "	Inner	......	1·004	·891	·113	11·2	"
K 1	" 15 sq. ft. per lb.	Outer	......	1·093	1·014	·079	7·2	"
K 2	" " "	Inner	......	1·093	·853	·240	21·9	"
L 1	Heavy sidewall, R. F. H.	Outer	......	1·257	·793	·464	36·9	"
L 2	" "	Inner	......	1·257	·761	·496	39·4	"

The weight of wax utilized by the bees from 2 inches square of foundation varies from ·079 grams to ·813 grams. The latter amount of wax was taken by the bees from the heaviest brand of foundation supplied, while the former was from the lightest brand. If we exclude the heaviest and lightest foundations, however, it will be seen that the amounts of wax utilized in cell formation are not subject to much variation, though it should be remembered that the method employed did not allow of any great degree of accuracy in the determination. It will, therefore, be wisest to consider average results before making deductions.

A study of the data of *A 1, A 2, B 1, B 2*, might appear to favour the view that the milling temperature exercised an influence upon the relative ductility of the wax and go to show that wax made at 89 degrees F. is more easily drawn out than that milled at 120 degrees F. This view, however, receives no corroboration from *F 1, F 2* and *G 1, G 2*,—a parallel case; and I am inclined to the belief that the larger amounts utilized in *A 1, A 2*, are due to the foundation supplied being heavier than *B 1, B 2*, (see table.)

On calculating the "per cent of wax added," it becomes apparent that in 18 cases (or 70 per cent of the trials made) this percentage was between 30 and 40; in three trials, more than 40 per cent, and in 5 instances, less than 30 per cent. As remarked in considering the "weight of wax added," the higher numbers were obtained from the heavier foundations.

Table III, which presents the averages of the foregoing data, was prepared for the purpose of making clearer the features already alluded to and to assist in the more ready comparison of the data from the various brands.

TABLE III.

TABLE of Averages, 1896.

Designating Letter.	Name of Wax and Mill.	Milling Temperature.	Average weight in grammes of 2-in. sq. of empty comb.	Average weight in grammes of wax added by bees.	Average percentage of wax added by bees.	Average weight in grammes of "foundation" after removal of cells.	Average weight in grammes of "foundation" wax utilized by bees.	Average percentage of foundation wax utilized by bees.
		F.						
A 1, *A 2*	Choice wax, Root mill	89°	2·695	1·294	92·3	·671	·729	52·0
B 1, *B 2*	" "	120	2·669	1·465	121·7	·802	·401	33·3
C 1, *C 2*	Foundation in general use, 1896	....	2·974	1·759	144·7	·791	·423	35·0
D 1, *D 2*	" " 1895	......	2·730	1·515	124·7	·815	·399	32·8
D 3, *D 4*	" " 1895	......	3·132	1·917	157·7	·756	·459	37·7
E 1, *E 2*	Heavy sheet, Root mill	120°	3·065	1·750	133·0	·878	·437	33 2
F 1, *F 2*	Inferior wax, "	89°	2·797	1·573	128·4	·788	·435	35·6
G 1, *G 2*	" "	120°	2·665	1·498	128·3	·719	·448	38·3
H 1, *H 2*	Choice wax, Given process	......	3·552	1·751	97·1	1·087	·713	39·5
I 1, *I 2*	Poor wax, "	....	3·755	2·173	137·3	1 121	·461	29·1
J 1, *J 2*	Patent process, 12 sq. ft. per lb.	....	3·252	2·248	223·8	·883	·121	12·0
K 1, *K 2*	" 15 "	......	3·442	2·329	213·1	·933	·159	14·5
L 1, *L 2*	Heavy sidewall, R. F. H	......	2·833	1·576	125·4	·777	·480	38·1

There would not appear to be any definite relation between the weight of wax added and that of the wax utilized, though the data of *I 1*, *I 2*, and *K 1*, *K 2*, make it evident that in very light foundations the amount of wax utilized is very small and the amount added correspondingly large. This would point to economy in supplying heavier foundations than the brands just referred to, if the question resolves itself into one of furnishing wax that can be utilized by the bees.

The average weight of "foundation" after the removal of the cells, is, all things considered, seen to be fairly constant. The greatest weight was from "Choice Wax, Given Process"—the heaviest foundation experimented with—, the least weight was obtained from "Choice Wax, Root Mill, temperature 89 degrees F." by no means the lightest brand used, but the brand from which the bees utilized the most wax.

In considering the average weight of foundation wax utilized, the largest amounts were from *A 1*, *A 2*, and *H 1*, *H 2*, the Choice Wax of the Root Mill and Given Process, respectively. The least amounts so utilized were from "Patent Process" 12 square feet and 15 square feet per pound.

In summing up the results of this year's work, we may conclude that, considering the values of the comb foundations to be dependent upon the extent to which they are utilized by bees in cell formation, the Choice Wax, Root Mill, temperature 89 degrees F., gave the best, and the "Patent Process," 12 square feet and 15 square feet per pounds, the poorest results. Both the Choice and Poor Wax of the "Given Process" give very heavy "fishbones." Concerning the other brands on these points, the differences are not sufficiently well marked to allow of any emphatic statement being made respecting them.

F. T. SHUTT.

NOXIOUS WEEDS.

The subject of weeds is one of burning interest all over Canada, and is too large to treat exhaustively in this place. Farmers, as a rule, are not well informed even with regard to the common species of aggressive weeds occurring on their land. Figures have already been given in former reports of some of the plants, the appearance, name and nature of which it was important, from their injuries, should be known so as to be eradicated whenever noticed. I submit herewith a figure of one of the new pests of Manitoba, namely the Cow Cockle (*Saponaria Vaccaria*, L.), also known locally under the different names of Cow Herb, China Cockle and Soapwort. This plant has been noticed as an aggressive enemy in field crops only during the last two years, and so far only in the province of Manitoba, where it has spread very rapidly, particularly in the Mennonite settlements and other parts of Manitoba, the pretty porcelain pink flowers sometimes occurring in such numbers as to give a reddish tinge to many acres of crop. The Cow Cockle belongs to the Pink or Carnation family. It is an annual herb with pale green, fleshy, sessile leaves, borne in pairs at each joint of the stem. The flowers first appear in Manitoba in July; they are about ¾ inch in diameter and are borne in large numbers, but each singly at the end of the thread-like branchlets of the many times divided flowering stems, as shown in the excellent figure herewith, which is engraved from a photograph taken by Mr. R. G. Mackay at Indian Head. Strong plants will frequently grow over two feet in height, with a diameter almost equal. The smooth

pod is inclosed in a five-angled calyx which enlarges with it. When the seeds are ripe the apex of the pod opens, forming a four-toothed orifice. Each of the pods with its enveloping five-winged calyx, measures about ½ inch in diameter, and contains an average of 16 round, black, slightly roughened seeds. This plant, together with the Tumbling Mustard (*Sisymbrium altissimum*, L.;=the *S. sinapistrum*, Crantz, of former reports), Ball Mustard (*Neslia paniculata*, Desv.), Hare's-ear Mustard (*Erysimum orientale*, R. Br.*), and False Flax (*Camelina sativa*, Fries.), has spread with almost incredible

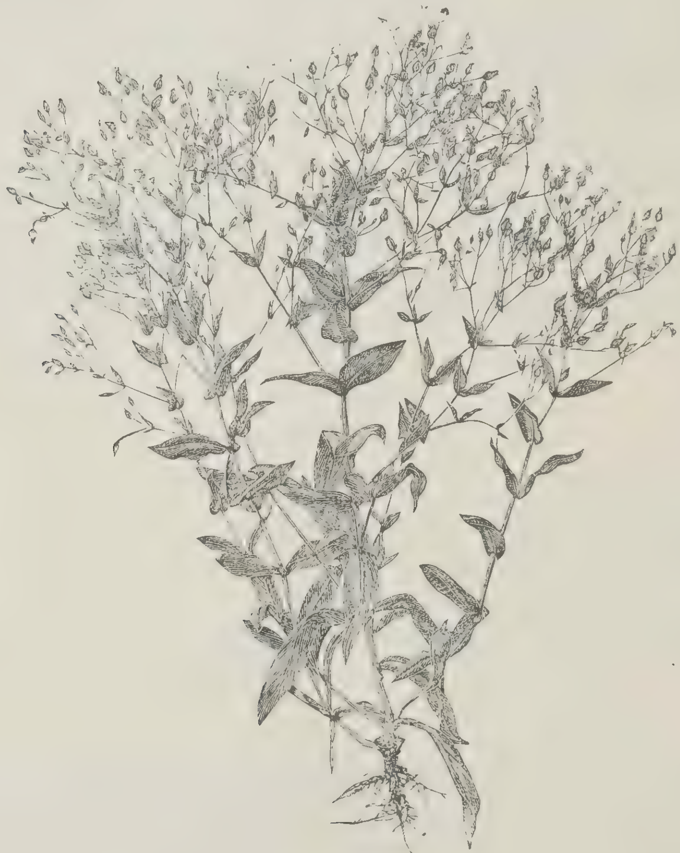


Fig. 18.—Cow Cockle.

rapidity through the wheat-growing districts of Manitoba and the North-west Territories. The indications are that all of these were introduced from Europe in flax seed, and, although in the case of the Cow Cockle and Ball Mustard, there was little in their appearance from which it might been anticipated that they would become troublesome, the rapidity with which they have spread shows how important it is that every one of these plants should be destroyed by hand pulling or summer fallowing as soon as detected on land in a new locality.

*This plant is now known under the name of *Conringia orientalis* (L.), Andrz. *Conringia* is quite a different genus from *Erysimum* and certainly should be separated from it.—J. F.

REPORT OF THE POULTRY MANAGER.

(A. G. Gilbert.)

To Dr. William Saunders,
Director Experimental Farms,
Ottawa.

Sir,—I have pleasure in submitting to you the ninth annual report of the poultry department of the Central Experimental Farm.

I am happy to say that the results of the past year have been more satisfactory—both as regards the yield of eggs and health of stock—than in any previous one. It is worthy of note that in this connection the rations were reduced in quantity, the fowls kept in greater activity and a much greater quantity of vegetables given than ever before. The noon ration of previous winters was dropped. Briefly stated the rations of the present winter consist of two, viz., morning and afternoon, with plenty of vegetables or green stuff, grit and egg shell forming material. After morning ration a handfull or two of grain was scattered in the litter on the floor to start the hens searching for it. As a result more eggs were laid, and the health of the laying stock was better.

As in the two previous years, care was taken of the laying stock during the moulting period. Indeed, effort was made to shorten the period of non-production by feeding of cooked meat waste, or cut bone, with a run in a small field containing clover and grass. As a result 568 eggs were laid in November, and 1,466 in December.

The foregoing subjects, with many others pertaining to the proper care and management of poultry, are treated in full in the following report.

I have to acknowledge the present of a White Leghorn cockerel of the Wyckoff strain, from Mrs. A. L. Jack, of Chateauguay Basin, P.Q., and a setting of Coloured Dorking eggs, from Mr. E. D. Dickenson, Barrie, Ont.

During the year addresses were delivered by me at many different points in the Dominion. The demand for instruction, by the farmers, on all points in connection with the rearing, managing, proper caring for and marketing of poultry, is very great. Equal interest is taken in the obtaining of eggs in winter, when prices are high and the best paying markets therefor. A point to be impressed upon the farmers, and which I have endeavoured to do, at the meetings referred to, is the necessity of getting the new laid eggs into cold storage warehouse, or brought to the consumer in the summer season, with flavour intact. There are far too many ill flavoured eggs brought to market, or placed in the consumers' hands, during the summer months. Knowledge and a little energy and care are all that is necessary to prevent such eggs reaching market or consumer. Care on the part of the middleman, or dealer, is also necessary.

During the past year numerous inquiries have been made by letter and in person as to the best methods of artificial incubation and rearing of early chickens; the most reliable machines; the best treatment and care of the chicks, &c.

I cannot close without testifying to the zeal, care and energy displayed in the proper manipulation of laying stock and rations by Mr. George Deavey, who, in response to my request, was allotted to my department. It is to the faithful carrying out of the instructions given and the interest taken by him in his work that much of the marked success of the year is to be attributed.

I am, sir,
Your obedient servant,

A. G. GILBERT,
Manager Poultry Department.

REPORT OF THE POULTRY MANAGER.

IMPROVED METHODS.

The aim of investigation and experiment by experts, breeders and others interested in poultry culture is to convert as much as possible of the waste of the farm—of the country—into money in the shape of poultry and eggs. And if this object can be attained when the products are worth most, so much more satisfactory will the result be. In my reports of 1893 and 1894, a good deal of space has been given to the consideration of rations best calculated to produce eggs in the winter season, when they are at their highest value. The importance of the subject fully warranted the attention given to it and as new, cheap and effective rations are being discovered from time to time, it is likely that experimental work in this line will continue and be of unabated interest for a long period. It should be said that in giving the rations mentioned in the reports of the years stated above only such constituents were named as were convenient and cheap to farmers and calculated to utilise the waste of kitchen, table and barn. The experience of the past year has gone to confirm, or to a certain extent modify that of previous years. It is this comparison of the experimental results of one year with another that leads to conclusions of value to all concerned in agricultural work. It may be of interest then at this point to compare the past and present methods of housing, feeding and managing the laying stock, during the period of artificial life and treatment. All with the object of obtaining the best results at the least cost.

DIFFERENCES IN PAST AND PRESENT POULTRY HOUSES.

Taking first for consideration the difference in past and present methods of construction of poultry houses we find the requirements of to-day are :—

1. That the poultry house, while cheap must be so constructed that the laying stock will be comfortable, particularly at night. In previous years the notion prevailed that any sort of a shelter was good enough for the hen. In too many cases, it is to be regretted, that idea is entertained to-day. Experiment has demonstrated that, if the farmer wishes to have eggs in paying quantity in winter his hens must be comfortably housed. It should be remembered if the laying stock are kept in a cold house the food is first drawn upon to supply animal heat. It is the residue over and above that requirement which goes into eggs. The house need not be positively warm. What then is the right temperature to have? If possible have it so that the water will not freeze. This has been said before, but it is an important point to remember.

In cases where the water does freeze the chill should be taken off three or four times daily. Pure water in regular supply is an important item in the daily bill of fare. A few degrees below freezing will do the Asiatic and American breeds no injury. It means economy to have the house fairly comfortable, at any rate. Experience has proved that a house with the living, or scratching room, facing the south, is the most comfortable. A window of goodly size on the south side will admit sunshine on bright days. In cold districts the window can be doubled. In this way warmth and light, two important factors, will comfort and incite the layers to exercise.

2. A modern poultry house will be so constructed that the laying stock will be disturbed as little as possible. With that object in view the platform and roost, with nests under platform will so be placed that the eggs may be gathered, the platform cleaned and the feeding and watering done from the passage way without the necessity of farmer or attendant going among the layers. Plan of a building embracing all the facilities mentioned is given further on.

3. The house should be so arranged as to prevent egg eating, a vice that is far too prevalent among winter layers. It is hoped by having the nests darkened and arranged as above described to prevent the eggs from being seen after they are laid, at the same time affording facility for their being easily gathered. In diagram No. 1 a plan of house with that object in view is shown.

4. Other requisites in a modern poultry house are, a board floor, which is best because it has been found to be dry at all periods of the year ; a dust bath whereby the fowls are enabled to keep themselves free from vermin ; a narrow trough wherein to feed

soft mash, &c., which may be V-shaped to be placed under the nests; a small box divided into two partitions, one for grit of some sort, the other for oyster shells, old mortar, &c.; a fountain or pail to hold the drink water. A fountain with a quarter-inch lip around, or partly around it, has been found the best for winter use, because the narrow lip permits of the fowls dipping their beaks into it to reach the water, but prevents their wattles from getting wet and so becoming frozen. A hen with comb or wattles frozen is not likely to be as good a layer as one that is free from frost bite. Small matters, it may be said, but nevertheless of very great import in obtaining desired results.

SUMMARY OF REQUISITES.

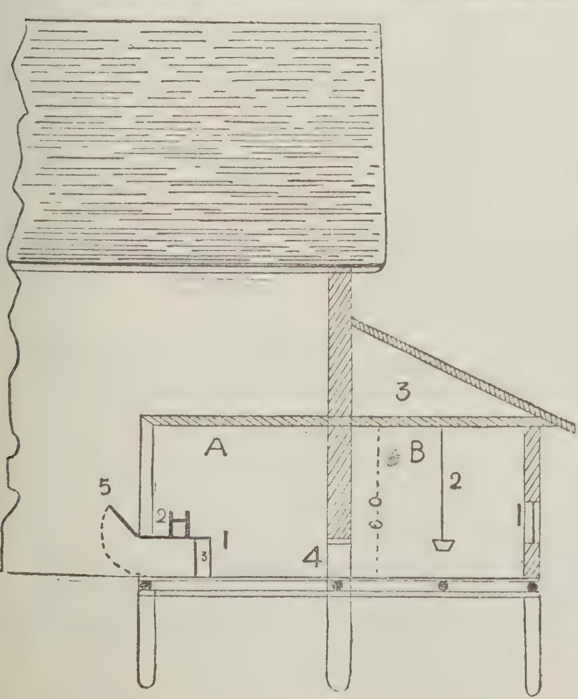
Summed up the points to be embraced in a cheaply constructed, up to date poultry house are :—

1. A comfortable house, if possible, divided into roosting room and scratching apartment.
2. Living or scratching room with a window of goodly size facing the south.
3. House so arranged that the laying stock will be disturbed as seldom as possible.
4. By admission of as much sunshine as possible into scratching room to incite to exercise.
5. By arranging nests so that they will be dark and secluded to prevent egg eating.
6. By attention to little requisities to secure paying results.

PLANS OF POULTRY HOUSES.

With the object of embracing the desirable points mentioned the following plans of easily constructed poultry houses, or, plans whereby portions of old buildings, barns, &c., may be adapted to poultry keeping, are given.

In report of 1893 a diagram of a poultry house intended to embrace many points of usefulness was given. The same diagram improved and modified in internal arrangements, with reasons for making alterations, is reproduced and shown below. It may be stated that the plan of 1893 has been adopted by several persons in the construction of poultry houses, with the most satisfactory results. First is given the plan of 1893 altered, so as to be more modern, and the reasons for making the changes :—



A.—1. Platform.
2. Support for roost with notch.
3. Entrance to nests under platform.
4. Slide door to scratching house.
5. Hinge board or door by which access can be had to nests from barn.

B.—1. Window facing south.
2. String with cabbage attached.
3. Space for straw, sand, gravel, etc., to be let down below.

The above diagram represents a house and addition that can be added to the end or side of a barn facing south. A small portion "A" of the end of the barn is partitioned off for the roosting and laying room. The ceiling is made low, and under this low ceiling is the platform and roost so placed as to economise the animal heat of the fowls during the cold nights, and keep them as comfortable as possible during that period. The roost should be a 2 x 4 inch scantling, broadside down and placed 10 or 12 inches over a platform which should be $2\frac{1}{2}$ feet wide and 18 inches from the ground. Under this platform should be the nests so arranged that by boarding the front of the platform, they (the nests) will be kept dark. The partitions of the nests will support the platform. The object of keeping the nests dark is to offer no inducement to the hens to stay in, or about them after the egg is laid, and to keep the other hens from seeing the eggs. Egg eating is so prevented and prevention is a great deal easier than cure. After keeping themselves comparatively warm by scratching busily all day in the scratching room, the layers require some warmth during the night, and in most poultry houses that is the very time they are coldest.

"B." This is an addition that can cheaply be made to the barn and should be to the south. A slide admits the fowls from A to B.

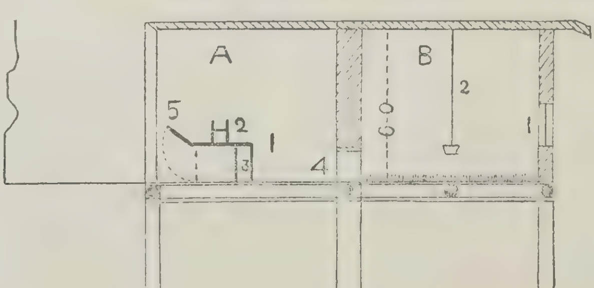
The floor may be of boards or earth, but it must be kept perfectly dry. On the floor should be placed chaff, oat hulls, straw, dry leaves or other material suitable, and in which the grain fed should be scattered so as to make the fowls actively search for it. A board flooring is preferable, as it is more likely to be dry. A narrow trough 2 or $2\frac{1}{2}$ inches wide should be attached to the wall so as to permit of the proper feeding of soft food, if given. The object of this scratching house is to keep the layers busy all day and as much as possible out of house A, where they are only wanted to go to roost in and to lay. A fair sized window or windows should be in the south wall so as to admit as much sunlight as possible.

The houses can be made as large or as small as the number of hens require, always allowing 6 square feet for each hen, at the least, in the scratching room, and 10 to 12 inches roosting room for hens of medium and large size.

The alteration in the original diagram consists in making access to the nests and platform possible from the barn by the hinged door 5. The object of the alteration is to permit of the eggs being gathered and the platform cleaned from the barn. Diagram No. 2 shows an arrangement that may be more suitable to the colder parts of the Dominion. Another modification is that in the instructions as to what should be placed on the floor of B compartment. Straw, chaff or other kindred substances have been found superior to sand for reasons given in report of last year, and which briefly summed up are that the straw was a better incentive to exercise, was healthier, not so cold to the feet of the layers, and was much more easily removed. A correspondent stated that he had found ashes mixed with the sand a good deodoriser. But such was not found to be the case in the pens of the poultry houses where sand had been placed, and from time to time a small quantity of coal ashes. Where straw or chaff is used on the floor, a dust bath will be absolutely necessary, for it is the means whereby the hens keep themselves free from lice.

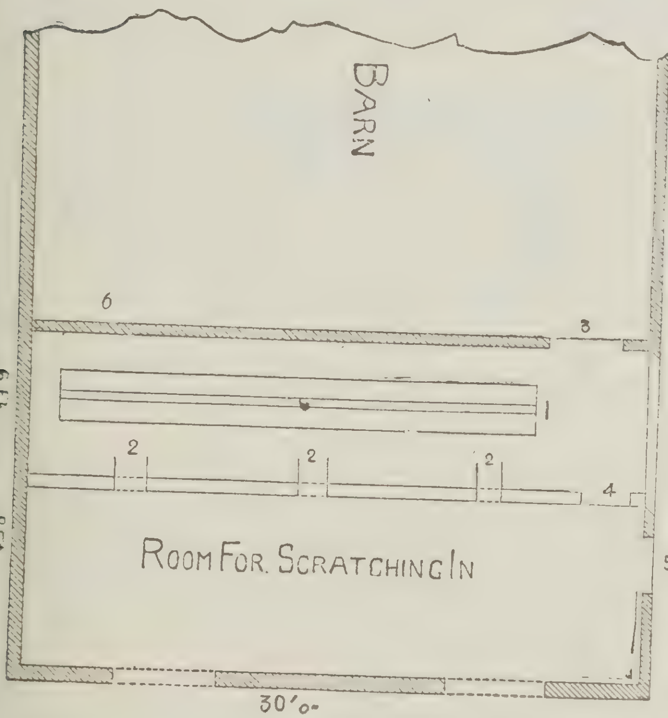
DIAGRAM NO. 2.

Showing arrangement of an hinged door to platform and nests, better suited to cold districts.



The above diagram, No. 2, shows the two sections, A and B of No. 1 diagram. It might be found impracticable in the portions of the Dominion where the winters are cold to have an entrance from the barn direct to platform and nests. In such cases entrance can be had to A compartment from the door 3 as shown in the following diagram No. 3. In the above diagram (2) the nests are reached by the hinged board 5 for the purpose of gathering the eggs, renewing the straw in the nests or spraying them with coal oil to prevent lodgment of vermin, &c.

DIAGRAM NO. 3.



1. Platform and roosts with nests underneath.
2. Slides to scratching room
3, 4 and 5. Doors.
6. Dividing wall between barn and hennery.

The above plan, No. 3, shows the end of the barn with the roosting and laying room and scratching room attached.

The numbers are explained as follows :—

1. Is the platform and roost with the nest boxes underneath. If the nests and platform are reached as in diagram 1, the platform will have to be put back so as to rest against the rear partition wall (6).

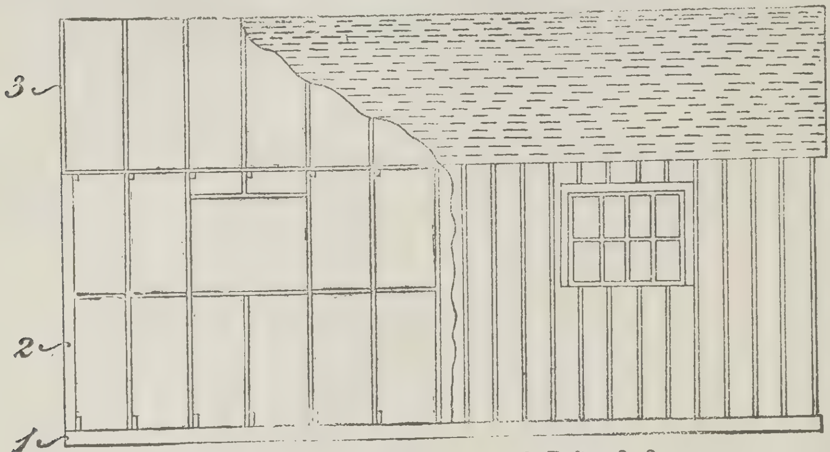
2. Are the slides to allow access to scratching-room. In a smaller house one or two would answer.

3 and 4. Are doors to get into apartments.

5. Is a side door to get in and out of the room for scratching, to clean up, &c. If it can be managed without, there need be no necessity for this door as the fewer openings the less cold the premises are likely to be. When cleaning up, the old material on the floor of the scratching room could be taken away through doors 3 or 4. The new litter for the floor could be let down from the loft 3 as shown in No. 1 plan.

Other Plans.

The following diagrams have been prepared by Mr. Anderson, carpenter, Central Experimental Farm, in accordance with figures submitted by me.

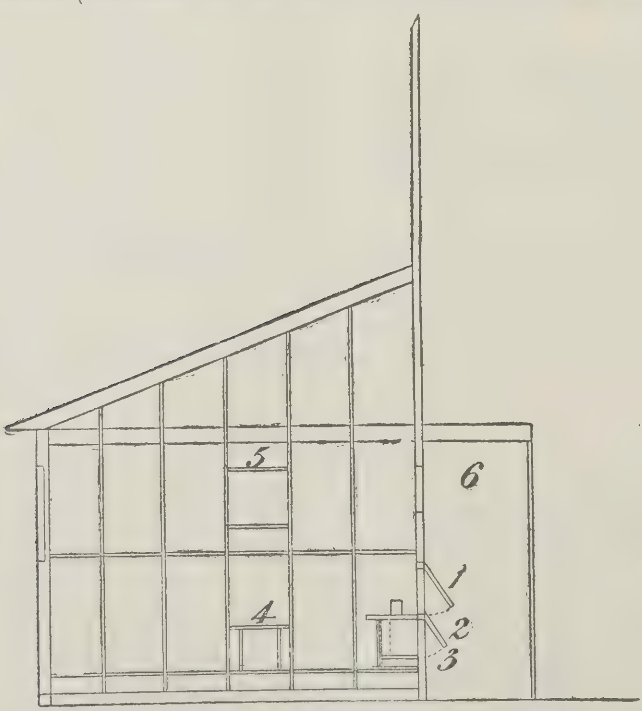


1. Sill 6×6. 2. Studding 2×4. 3. Rafters 3×3.

Section 1.

Front Elevation, Facing South.

The above is the front elevation of a poultry house to adjoin a barn. From a passage-way inside the barn (not shown in No. 1 section) the nests and platform may be reached,



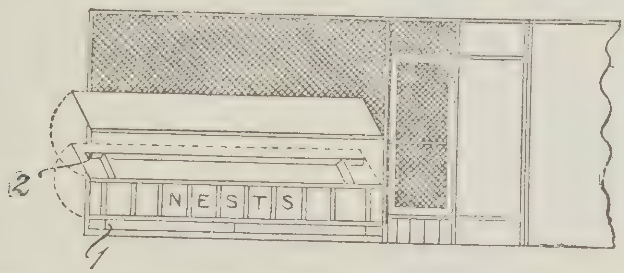
1 and 2. Hinged doors permitting access to nests and platform. 3. Sliding feed trough. 4. Slide. 5. Window, if required. 6. Passage-way.

Section 2.

the first named to gather the eggs from, and the latter to clean. The passage-way is shown in diagram No. 2 and need not take up much room. Where the lean-to is not attached to a barn, it will require a pitched roof, and the passage-way will be at one side. It is sometimes more convenient for a farmer to have a "lean-to" to a barn than to have a separate building.

Section 2.

Shows' frame work, the hinged doors leading to nests and platform and the feed troughs, small door and ventilating window if required. The object of the hinged doors is to permit easy access to platform to clean it and also to nests from which to gather the eggs, from the passage way without entering the pens and disturbing the laying stock.



1. Feed trough. 2. Roosts above platform. 3. Platform under roosts, 2 feet wide.

Section 3.

The above section 3 shows the hinged doors, permitting access to platform and roosts and nests underneath, open. It also shows the feeding troughs underneath. As already explained, the object in cleaning, collecting the eggs, and feeding soft food from passage-way, is to prevent unnecessary disturbance of the laying stock. Ample opportunity is also afforded for renewing straw in nests, spraying with coal oil, &c., from passage-way.

Size of Pens.

The size of the pens is calculated at 12 x 12 feet, with two feet off for nests and platform. If 15 fowls are put in a pen of above dimensions, it will allow 8 square feet to each bird. No less than 6 square feet, under any circumstances, should be given to each fowl. The more room allowed the laying stock the better will results be.

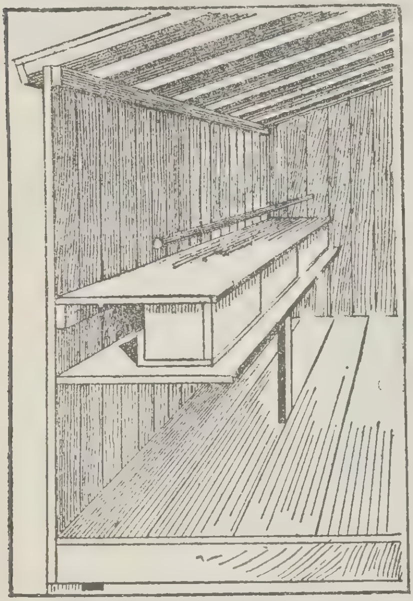
How to Build.

The sills should be 6 x 6 ; studding, 2 x 4 ; rafters, 2 x 6 ; joists, 2 x 8 ; flooring, double inch boards, with paper between.

The sheeting outside to be tongued and grooved with battens ; to be sheeted with dressed or rough lumber inside and outside. Paper inside and outside on studding under the sheeting.

The following diagram is taken from the Reliable Poultry Journal of recent issue. It is well calculated to prevent egg eating, and has the platform and roost above the nests. It can be adapted so as to be reached from the passage-way and if laths are fixed in the partition behind the nests, the feeding of the soft mash and cut bone may also be done from the passage-way.

The diagram was prepared by A. S. Gish, Esq., M.D., of Abelene, Kan, who writes the following description of it:—"Herewith is illustrated a combination roost, droppings-board and row of nest boxes. Where darkened nests like these are used there is far less liability of the hens contracting the habit of egg-eating. As to size, build the nests according to the size of the hens. If intended for Leghorns or medium-sized hens, nests 12 x 12 inches will do; if for Brahmas, Cochins, &c., do not fail to have the nests 15 x 15 inches in size. Be governed also in the height of the nests by the size of the fowls. Seven to eight inches will do for Leghorns, while for the big breeds they will need to be ten inches high. Fill in enough nest material so that the hens can only creep on and off the nest, without being able to stand up in them and get at the eggs to eat them."


NEST BOXES TO PREVENT EGG EATING.

PROPER FOODS AND HOW TO FEED THEM.

The proper housing of the laying stock has been fully considered in the foregoing pages. Of equal import is the next subject of foods and how to so feed them as to secure a continuous supply of new laid eggs throughout the winter season. It has already been said that in feeding for eggs in winter the farmer should utilize as much waste as possible. It is by the judicious composition of the ration that much of the waste may be used. The aim is to have the rations both cheap and effective. To be effective the rations must be well balanced, that is they should embrace the constituents that go to make both egg and shell, at the same time keeping the layers in proper condition and health. What then are effective egg producing rations?

Cut Green Bone.—So far, no ration has been found to so nearly fill the requirements for egg and shell, at the same time utilizing what is to a great extent waste, as the green bones of the butcher shops, or the farm. These should be cut up by small mills, made for the purpose, or broken up into fine pieces and fed in the ratio of one pound to every sixteen hens, three times per week. Cut bone, is also excellent to fatten chickens intended for market. But careful handling is necessary in feeding it, in other than judicious quantity for our experience last winter in the poultry house was that fed every day, although in small quantity, it made White Java and White Plymouth Rock hens so fat, towards the end of the season, as to lay malformed eggs with thin shells. Mr. M. E. Taffa of the California Experiment Station and Agricultural College in a recent address before the Petaluma Poultry Association endorses the value of cut bone, as follows: "Shells are not the only source for the lime necessary for egg shells. Bones also contain a large percentage of lime, as is seen from the following analysis of clean, dry bones of oxen and sheep.

Carbonate of lime	6 to 7	per cent.
Phosphate of lime	58 to 63	"
Phosphate of magnesia	1 to 2	"
Fluoride of calcium	2	"
Organic matter	25 to 30	"

Fresh green bones also contain besides the lime compounds, some proteins or flesh formers, which add to their value as a poultry food. The best means is to have them broken up by means of the bone cutter. One pound of the green bones is generally considered enough for sixteen hens."

The quotation is certainly valuable testimony to the worth of green bones as a winter ration. The question is often asked "Where are bone mills to be had?" Bone mills are made, to be used by hand, at a cost of \$5, \$7 to \$15; to be run by machinery from \$15 upwards, according to capacity. They are manufactured in Montreal and Toronto and will no doubt be heard about through agents and the advertising columns of newspapers. In a previous report farmers who object to the cost are advised to club together, purchase a power machine, place it in, or adjoining a creamery, or factory to which they take milk and utilize the power to be generally found in such buildings to cut the bones. It is the work of a very few minutes to cut up bones sufficient for 100 hens. Where there is a will, no doubt, a way will be found.

Kitchen and Table Waste.—Another form of waste which may be used with good effect is that of the kitchen and table. No better or more effective ration can be made than that composed of the peelings of potatoes, turnips or other vegetables throughly cooked and with it mixed the bits of bread, meat and vegetables of the table, the whole to be stirred into a stiff mass by the addition of provender, ground wheat, oats, bran, or steamed and cut clover. Unmarketable vegetables boiled and used instead of ground grain, in the mash, will make a wholesome and welcome change. Mrs. Joseph Yuille of Ramsay Township, near Carleton Place, the well known butter maker claims to have reduced the cost of her hens to 58 cents per annum each, by using the dairy and barn waste and ensilage. When at a meeting in South Huron some time ago the writer was assured by a farmer that he fattened his chickens for market by feeding then in great part with ensilage.

Other cheap egg incentives may be had in places were animals are killed for home use, or, sale on the markets in the shape of livers, lights, heads, &c., &c., which may all be boiled or fed raw, if the hens are accustomed to the latter. If not the feeding of raw meat is apt to scour them. Boiled livers fed in the quantity of one ounce per diem to each layer has been found safe and effective. If the layers are yielding a regular supply of eggs and are provided with other material to supply lime for shell the allowance may be doubled. Dr. Twitchell, of Maine, in addressing a meeting of farmers in Sussex, N.B., in October last, on poultry keeping said, "Sheep heads are always handy and they can easily be broken up with an axe. No bone mill is required to cut them up. They are an excellent form of bone for laying hens." It may be asked if it is possible to get egg production without feeding bone or meat? It is certainly possible to secure eggs in paying quantity in winter by feeding a warm mash, as given in a previous page for the morning ration with green food and whole grains so long as lime for the shell is supplied. In the matter of rations it seems after all as if the farmers will have to be governed by situation and circumstances.

A farmer who is in the neighbourhood of a town or city with a winter market of prices ranging from 25 to 35 cents per dozen for new laid eggs is favourably situated. He is not only near a market of high prices, but the slaughter houses and butcher shops, where green bones can be purchased at cheap cost, or if he likes to arrange for it he can secure the waste of the hotels, &c. On the other hand the farmer who is distant from such markets and who sells to a middleman, must be content with smaller profits, and to him the less costly the ration the more valuable will it be. To him also should the experimental work going on with the view of discovering cheaper and more effective rations be more interesting. It might be economy after all in his case, if there is difficulty in obtaining bone or meat, to purchase some form of the blood or meat preparations; granulated bone or ground oyster shells for supplying lime. Blood meal is fed in the proportion of one ounce to every ten hens, and costs from \$3.50 to \$3.75 per 100 pound bag. The cost of granulated bone is \$2.25 per 100 pounds, and ground oyster shells \$1.25 per 100 pounds. A bag of blood meal of 100 pounds fed at the rate of 5 ounces to 50 hens every day would last 300 days or two winters of nearly 5 months each. One hundred hens would of course take twice the quantity or consume it in half the time. At our poultry house green bones are delivered at a cost of one to one cent and a half per pound. In early summer a bag of 100 pounds weight of deodorized blood meal was purchased to try its effect on moulting hens as compared with cut bone, and results will be found under subhead "moulting hens."

Green Stuff.—Laying hens require a liberal amount of green stuff and here is another opportunity to turn waste to good account in the shape of unmarketable vegetables. A market gardener who kept a flock of Barred Plymouth Rocks informed the writer that his hens during winter did better laying and were more healthy on oats and plenty of cabbage, than on any ration he fed them. In such a case some kind of grit would have to be supplied with regularity and in liberal quantity, or the continued feeding of oats without it, would be very apt to make the hens "crop bound." In the poultry house during last winter lawn clippings, which had been cut and dried during the previous summer and carefully put away, on being cut into small lengths and steamed were very much relished by the hens. It was fed by itself, or, mixed in the morning mash. The clovers preserved and treated in the same way were equally satisfactory. An occasional mash of turnips or carrots mixed with ground grains is a wholesome change. Mangels, carrots or turnips may be fed raw and will be carefully picked by the hens. Speaking of the value of green stuff in the winter production of eggs, Mr. D. J. Lambert, a well known poultry writer says:—Green foods, as has been often said, are too sparingly given. The majority of poultry-keepers feed too much grain. Less grain and more grass should be the watchword. Cabbage, turnips, cut clover, onions or anything of a vegetable nature, cheapen the cost of feeding, tend to keep the fowls more healthy and that means increased egg production and consequently more profit." This extract is given in report of 1894, but it will bear repetition. In cases where vegetables are scarce, a substitute may be found in oats, barley or wheat boiled and fed, occasionally, in the shape of a warm mash, alone, or mixed with small potatoes.

Minor Requisites.

Grit wherewith the hen may grind up her food must be supplied in some form. The sharper and harder the grit the better. There are many and cheap kinds of grit on the market. Broken crockery, flint stones, hard limestone, sharp gravel are all to be had in different localities. The old crockery must be broken into pieces, small enough to be swallowed easily. The hen at large supplies herself with what grit she requires, but must be supplied with it in winter quarters.

The Dust Bath is necessary to allow the hens the means of keeping themselves free from lice. Lice infested hens are not profitable, hence the necessity of keeping them free from these undesirable tenants. Material for the dust bath can be found in the majority of cases in the shape of dry, fine sand, earth or road dust.

A small quantity of sulphur or insect powder mixed with the contents of the dust bath will be found beneficial. Mr. Fred V. Theobald, in "Feathered World," of London, England, who has given the subject of "Poultry Parasites" some study, writes:—"Lice will not flourish on birds, as a rule, if they are kept in a clean, healthy condition. Several notable exceptions have, however, come to my notice. Still they are always worse in damp, dark and ill ventilated houses. Lice get into parts of the fowl that they cannot readily reach. Naturally birds try to rid themselves of these parasites by dusting in sand, &c. Dust baths are best made of wooden boxes filled with sand soaked in paraffin, about a pint of paraffin to a bushel of sand. Finely divided gypsum with a small quantity of paraffin or carbolic acid added is also serviceable. This latter is said to be especially effectual, the smell of the paraffin when mixed with gypsum remaining for a considerable time. Sulphur added is also of much benefit. Finely powdered lime is also effectual." In the poultry house, finely sifted coal ashes mixed with sand in the dust bath has been found useful.

HOW TO FEED THE RATIONS.

Of almost as much importance as the foods, is a knowledge of the proper way to to feed them. To over-feed is actually worse than the opposite treatment. But with proper knowledge and thorough appreciation of that which is being aimed at, the two

extremes will be avoided. It is in the medium course that success lies. The beginner is tempted to give more food to his hens, which are beginning to lay well, under the impression that he will get better results in so doing. The experienced poultryman will tell you that to avoid overfeeding is one of the hardest rules to observe. It is the cause of much of the ills that poultry suffer. More, it is fatal when practiced for any length of time. To further stimulate hens that are doing their best, is to thrash the horse going at his top speed to make him go quicker. The twin factor in judicious feeding is exercise. The three great factors in the winter production of eggs are cut bone (or meat), green stuff and exercise. Cut bone should be fed in quantity of one pound to every 16 hens, or one ounce to each hen. Feed three times per week or once daily if hens are laying well.

Green stuff—Cabbages can be hung from the ceiling to within 2½ feet of the floor. Feed mangels, carrots, turnips, &c., raw, or boil the latter and mix with ground grains into a stiff mash. Clover hay should be cut into quarter inch lengths and steamed by placing in a pail and pouring boiling water over it, the night before it is wanted for use. Cover the pail after pouring in the boiling water. So steamed it may be fed alone or mixed in with mash. Lawn clippings may be similarly treated.

Exercise—Use all ingenuity to keep the layers in exercise from morning till they go to roost. Throw all grain fed into litter, composed of chaff, straw, cut hay, oat hulls, dry leaves, &c., which should be on the floor to the depth of 4, 5 or 6 inches.

AN IMPORTANT FACTOR IN WINTER MANAGEMENT.

An indispensable factor in successful winter management is to have the proper fowls of the proper age. This is not a new subject, as it has been treated at length in previous reports, but it is one regarding which inquiries are yet frequently made, showing that its importance is either not understood, or not appreciated. Experience has proved that hens over three years of age moult slowly; that it is late in winter before they begin to lay. Meanwhile, they will have eaten up much, if not all, of the profit they afterwards make in the remaining short period of high prices. It is true that occasionally a three year old thoroughbred is to be found that is a valuable breeder, on account of certain good points she possesses, but that is a matter more directly appertaining to the breeder of exhibition stock than to the farmer, whose sole aim is to obtain as many eggs as he can from productive hens. But it is quite possible and sometimes desirable that a farmer should utilize a valuable breeder and how he can do so is told in a following page. The most profitable winter layers have been found to be one and two year old hens and robust pullets. During the winter of 1894-95, four early White Java pullets laid more eggs than any four pullets, or hens of any other breed. And what was still more gratifying the eggs laid by the same pullets in spring, proved fertile in most cases and the chickens strong and robust, showing descent from a strain of undoubted constitutional vigour. And it is stock of such quality that the farmer will find his best money makers. Again, three year old hens are not so profitable for the reason that they are disposed to put on fat, that is the food which will go into eggs in younger birds, is more likely to go into fat with them and fat hens are useless as layers or breeders. Another important consideration in selecting winter layers, is to choose such breeds, as are more likely to put the stimulating rations into eggs, rather than fat. It is well known to experienced breeders that pullets will stand more forcing than older stock; that rations calculated to go into eggs in the case of the Spanish class, viz.: Leghorns, Minorcas, Andalusians, &c., are more likely to go into fat in Brahmas, Cochins, Langshans, Javas and Plymouth Rocks, and certainly so, if the birds are old. But the main points for the farmer to be guided by in the selection of his laying stock are:—

1. Keep no hen for an active winter layer over two years of age.
2. Weed out the non-productive fowls from the money makers. There are, in all flocks, likely to be some drones. To keep them is to detract from the profit made by the active layers.

A SUMMARY OF POINTS.

In the foregoing pages the factors which experience of many years have proved to be the most important in the successful winter management of poultry, have been considered at length, and summed up are as follows:—

1. Winter houses of easy construction and latest design.
2. The beneficial results likely to accrue from a comfortable temperature and bright interior.
3. By easy and convenient arrangement to avoid unnecessary disturbance of the laying stock, and prevent possible egg eating.
4. Foods for egg production and how to feed them.
5. The different requisites for successful winter management.
6. Various forms of cheap incentives to egg production.
7. Proper fowls and their proper age for profitable winter laying.
8. Instructions as to feed and housing which if followed will prevent egg-eating and feather picking.

SHORTENING THE SEASON OF NON-PRODUCTION.

The moulting period, that is the season occupied in the shedding of the old and the growth of the new feathers, is one of comparative non-production. If we can shorten the time of non-production an important point will be gained. Experiments for some seasons have been conducted with that object in view and have taught:—

1. Young hens moult earlier and easier than old ones.
2. That a run in a field or fields, where clover, grass and insect life are to be found are very important essentials.
3. Where the layers are confined to limited runs that meat, in some shape, and green stuff must be regularly supplied.

The treatment of the farm laying stock for some seasons past, and from which the foregoing experience has been gained, may briefly be stated as follows: At the beginning of July, when eggs were no longer sent out for hatching purposes, the male birds were removed to separate runs, and the hens were allowed to run promiscuously in small fields in rear of the poultry buildings. During the month of July, they were lightly fed twice per day, with occasionally a light feed at noon. Wheat was principally used. When buckwheat was fed, it was mixed with oats. During August, a mash composed of ground grains and deodorized blood meal—the latter in the proportion of one ounce to every ten hens—was fed three mornings of the week, with a light feed at noon, and a more liberal ration at late afternoon. The mash was mixed, or partly so, with any milk that was left over from the rations for the young chicks, which were in fields in front of the buildings. Occasionally a feed of cut bone was given. This treatment was continued until the new feathers were fairly well grown, when the noon ration was dropped, and precautions taken to prevent the fowls getting too fat. Towards the end of October, the feeding of cut bone in the proportion of one pound to 15 hens was resumed. It was fed three times per week, and a less quantity every day from middle of November. The rations were two in number per diem, with vegetables at noon. The fall was unusually open, and all the stock had a free run outside until the 18th November, when a slight fall of snow necessitated their confinement indoors. The snow and cold did not last many days, when all the stock were allowed out to the runs in connection with the different pens. The result of the foregoing treatment was that the yearling hens were first over their moult, and laying, while the older stock, although well advanced, did not commence to lay until later.

As the subject is one of considerable importance, the following from Dr. N. W. Sanborn's work on "Poultry Diseases" will be of interest. "So many birds pass through the moulting process with difficulty, if not disease, that it is well to call attention to it. Moulting is done during the late summer and fall months, when the weather is warm. A moulting hen is easily fattened. Hence, at this time of the year, feed lightly of those foods which produce fat. Corn, cornmeal, middlings, potatoes, must be

used sparingly. Increase the amount of green bone, bran, and skim-milk. A run in a field of clover will be of help in moulting. Do not try to hasten the time of the moult by keeping in a warm pen or by feeding cotton seed or linseed meal. Keep all males by themselves during the moulting season. If hens are not well fed at this period of their life they may learn the habit of feather pulling or egg-eating. They should also be housed so as to give them shelter from hot sun or cold storms. The ideal place for a run is in an apple orchard, where, in addition to the grass, may be found insects in fallen fruit, &c. If the orchard be added to the scratching-pen house, we have an arrangement suited to all conditions of sun or temperature, and a place where birds will safely pass through the exhausting process. Hens, during moult, lay few eggs, unless in perfect condition at its commencement, and fed the right foods. Birds should go into the moult not fat, free from lice, and with no red mites in the house." If necessary, the writer quoted from, recommends as a tonic one-half tea-spoonful tincture nux vomica to 2 quarts drinking water, or twenty grains citrate iron and quinine to same quantity water. Mr. W. A. Kinney, of Yarmouth, N.S., wrote, that he fed boiled beef heads, crushed in a bone-cutter, as the sole ration to his laying hens, with a result of shortening the moult to a remarkable extent, and hardly any stoppage of egg-laying. It is presumed his hens had free run. Miss Ryan, of Barriefield, near Kingston, Ont., writes a very interesting later, dated Oct. 7th, ult., on "Shortening the Moult," from which the following extract is taken :—"In regard to helping the moult, I beg to say that on 13th August I plucked a year-old hen and six days later plucked eight more. They were all laying at the time. The fowls did not seem to suffer the least inconvenience, but on the contrary seemed more lively. Some of the down was left on their bodies. They kept on laying for ten days after being plucked, and then ceased until Saturday last, 3rd of October, when the first one plucked, on the 13th August, laid, and has continued to do so since. A week after being plucked the body of the first one was entirely covered with new pin feathers. Before releasing them from my hold I dusted each one liberally with insect powder. All the hens plucked are now (7th Oct.) entirely covered with beautiful, glossy, new feathers, wings and all. In marked contrast are the older hens and rooster, which are unplucked just beginning to mope and look drowsy in their first stage of moulting. There is not a doubt that in this case the forced moulting was a success. I do not intend to let another hen or rooster I own suffer with cold or discomfort from moulting in the old fashioned way. I should add that the fowls experimented on got no extra care."

It will be seen from the foregoing that greater attention is being paid to the laying stock while going through the critical period of moulting. There is no doubt that any extra care and attention bestowed at this period, will be well repaid by an earlier and more generous egg yield.

THE PROPER METHOD OF SELECTING BREEDING STOCK.—As it has been frequently urged in different quarters, apart from previous reports that, the male bird be kept separate from the winter layers, the farmer may ask, how is he to manage so as to have fertile eggs in spring? It would be better if circumstances would permit him to do so, to keep by themselves during the winter and without stimulating them to lay, seven or nine of his best fowls, with which he should mate a vigorous male in early spring. Not having laid during the winter these fowls would begin to lay early in the season and then eggs would likely be much more fertile on that account and the progeny be strong and vigorous. Or, the farmer can select in late February, seven or nine of his largest, best shaped and most prolific layers and mate with them a vigorous male, which has come from a well-known strain of good laying fowls. So starting with his best the farmer is likely to better the quality of his stock and will really be going from good to better. As a consequence of the usual careless and haphazard methods of breeding poultry; the inferior rather than the superior —in both egg layers and market chickens—are too frequently seen in the barn-yards of the country. By a little trouble, taken at the right time and in the manner described, a superior quality of poultry throughout the country could be had in one season. If possible have thoroughbreds and if it cannot be, by all means introduce thoroughbred blood by mating a Barred or White Plymouth Rock, a Wyandotte, Brahma or Langshan male with the pick of your mixed breeds in the manner described.

It will not take long to save sufficient eggs for hatching and selling, and then the male bird should be removed and kept apart until wanted again, or sold if so desired. The breeding stock should be kept in their pen for a week after the removal of the male and then allowed to run with the other hens. Every farmer, who wishes to have new laid eggs, of superior flavour, to sell during the summer on market, to dealers or to special customers should make it a rule to allow no male bird with the laying stock. The reasons for so doing are given at length in report of last year.

WORK OF THE SUMMER.

The principal work in the poultry yard in summer is, pushing the rapidly growing chicks so that the cockerels will make as much weight, in as few months, as possible.

With proper care and food, Plymouth Rock, Wyandotte, Java, Langshan and Brahma cockerels will make gain at the rate of one pound of flesh per month. That is at the end of four months cockerels of the above named breeds should weigh 4 pounds each, or 8 pounds per pair. The gain may not be had in the first 5 or 6 weeks of the chicken's life, but the weight will be had in the time mentioned. Every farmer who takes the trouble to properly push his chicks can have this result. The requisites are the breeds and the proper food. The pullets, if at all early, will repay any care and feeding by rapid growth and early laying. As the cockerels attain the desired weight they should be killed, carefully plucked by hand and taken to market. Nicely dressed, well fattened birds are certainly more inviting in appearance than the blue black looking and bruised scrubs too often to be seen. If the farmers intend to benefit by the shipment of choice poultry, in cold storage to England, attention will have to be given to the conditions necessary to success.

THE WORK OF THE PAST YEAR.

At the beginning of the year the fowls of all kinds were in good condition, and the output of eggs was fairly satisfactory. Experience of past years has shown that it is better on the approach of warmer spring weather to reduce the stimulating rations, to underfeed rather than overfeed. In the case of a farmer who has but one breed, and who can take advantage of a fine day to allow his stock a run outside, this precaution may not be necessary. But where a number of breeds are and have been side by side, in pens of limited size, during the winter season, and most of them are to be used as breeders, it is better to lessen the quantity of stimulating food. It is best at all times to vary the diet, but at this time as much change as possible in the rations are desirable. It is also at this time that the fowls seem most predisposed to egg eating and feather picking. The benefit of having a scratching room, or shed as shown in diagram will be apparent at this period.

MAKING UP THE BREEDING PENS.

Date.	Breed.	How mated.	Remarks.
March 2..	Barred Plymouth Rocks	1 cock 9 hens..	
" 2..	White "	1 " 8 " ..	
" 2..	Silver L. Wyandottes	1 cockerel 9 " ..	
" 2..	Light Brahmas	1 cock 7 " ..	
" 2..	Black Minorcas	1 " 9 " ..	
" 2..	White "	1 " 8 " ..	
" 2..	Andalusians	1 " 9 " ..	
" 2..	Coloured Dorkings	1 " 8 " ..	
" 2..	Houdans	1 " 3 " ..	
" 2..	Black Minorcas	1 cockerel 4 " ..	Second pen.
" 11..	White Leghorns	1 " 11 " ..	
" 11..	White Wyandottes	1 " 7 " ..	
" 13..	Langshans	1 " 9 " ..	

The delay in mating the Langshans was occasioned by awaiting the arrival of a cockerel. There was a greater demand for eggs of all kinds for hatching than could be supplied, but more especially eggs of White and Barred Plymouth Rocks, Black Minorcas, Silver Laced Wyandottes and White Javas. As soon as the weather permitted the fowls were all allowed out in the outside runs and were much benefited thereby.

EGGS SET AND CHICKENS HATCHED.

When Set.		Description of Eggs.	Chickens Hatched.
April	2..	13 Coloured Dorking	3
"	7..	11 White Java	2
"	9..	13 " Wyandotte	6
"	21..	15 Silver "	10
"	22..	11 Coloured Dorking	8
"	29..	11 White Minorca	6
"	29..	13 Light Brahma	7
"	30..	13 Barred Plymouth Rock	7
"	30..	13 Andalusian	9
"	30..	13 White Wyandotte	13
May	1..	13 Langshan	8
"	7..	13 White Minorca	7
"	12..	13 White Leghorn	9
"	16..	11 White Plymouth Rock	7
"	27..	13 S. L. Wyandotte	8
June	6..	11 Black Minorca	8
"	13..	11 White Plymouth Rock	7
"	19..	11 Golden Poland	5
"	8..	13 Silver L. Wyandotte	8
"	9..	13 White Leghorn	5
		248	143

In two or three of the early hatches several eggs were broken by the hen in the nest, owing to the shells being somewhat thin.

SITTERS.

For early sitters, when opportunity offered, Wyandottes or one of the cross-bred hens were chosen, as they are lighter and not so clumsy as those of the heavier breeds. A comfortable nest was made of straw, and well dusted with carbolic disinfectant powder. Three or four china eggs were placed in the nest, and on these the hen was allowed to sit for two or three days, receiving meanwhile a dusting of the powder named. The powder in the nest and in feathers of the sitter probably rid her of any lice. At end of the two or three days the valuable eggs were given to her. Food, water, grit and dust bath were convenient to the sitters at all times. The eggs were examined when the sitters were feeding, or at other convenient periods to see that none were broken. The shells of early eggs--particularly those from hens in limited runs—are apt to be thin, and should one be broken and allowed to contaminate the others, no satisfactory results need be anticipated from that hatch. In the event of an egg being broken it is necessary to at once remove it and the dirty straw, and to wash gently the others in moderately warm water, and replace them with care. If the breast feathers of the sitter is very much soiled, it is better to clean them, or the newly washed eggs will be again soiled. All this may be avoided by having eggs with solid thick shells, careful sitters and properly arranged nests. It is best, if circumstances will permit, to set two or four hens together, and at the end of five or six days test—by means of egg tester—all the eggs, removing the clear or unfertile ones, that is those without any germ, and the addled eggs, or those in which the germs have started, and ceased from some cause

to progress. The fertile eggs may then be given to the one or two hens, and the spare hen or hens re-set. Experience will soon teach the difference in the unfertile, addled and fertile eggs. Of course when an incubator is used, full instructions as to testing the eggs will accompany it. Egg testers may be had from any of the incubator manufacturers, or may be made by a local tinsmith, if pattern is furnished.

PROGRESS OF THE CHICKS.

For the first few weeks of their existence the chicks of both land and water fowl require care, the young turkey chicks requiring the greatest care until they are partially feathered, or "shoot the red." Many thousands of young chickens of fowls and turkeys and an equal number of ducklings and goslings are lost every year from carelessness, or want of knowledge how to care for them. The young chicks of the fowls in the poultry house were allowed to remain in the nest, after hatching out for 24 hours, or until thoroughly "nest ripe." If a chicken has been crushed in the nest it should be removed and so may be the broken egg shells, if you are expert. But it is best for the beginner to leave the nest alone, or, more damage may result by disturbing the mother hen, who is sometimes inclined to be fussy on the occasion. In one case last spring the hen mother was seen to pick and kill two or three of the newly hatched chicks. She was of course removed and her family given to another brooding hen which fortunately happened to be on hand. In another case the fussy sitter was discovered crushing the chicks as soon as they began to "peep," in their efforts to break through the shell. She had also to be removed. All those who hatch out a number of chickens every year have varied experiences of a similar nature. On removing the family from the nest, the mother hen should be put to one side and allowed to feed and drink. She is voracious after a protracted fast of 36 hours, and if not fed will gobble up the more dainty food of the chicks. This is particularly noticeable in the turkey mother. The first feed of the chicks should be stale bread crumbs or stale bread soaked in milk squeezed dry and fed in small quantity. Weather permitting mother and brood should be removed to a coop outside, on grass, and in the sunshine if possible. If kept indoors the young chicks must run on dry earth, or sand, or both. If they do not they will surely wilt away. After a day or two granulated oatmeal and boiled rice may be given with good effect. Grain should not be fed for 12 or 14 days. The food should not be sloppy nor should any be allowed to remain about the coops until sour. After the youngsters are fairly on their feet the diet should be cheap, but wholesome and in this much of the house and kitchen waste may be used. Feed a little but often, keep the chicks growing. A grass run and insect life will cause robust health and rapid development. The mother hens in our department were kept with the chickens for 4 or 5 weeks or until they were fairly feathered. They were then removed to the runs and if in good condition were either laying, or about to do so.

WEIGHT DEVELOPMENT.

The care of the chicks, from their hatching, told in rapid flesh development and robust health. Watch was kept for symptoms of lice. To avoid possible lodgement of these pests the coops were frequently sprayed or sprinkled with coal oil, and on several occasions the mother hen was wiped under wings, in breast and fluff with a cloth dampened, not wet, with coal oil. Plymouth Rocks, both barred and white; Silver Laced and White Wyandottes with Coloured Dorkings made the most satisfactory weight development as shown by the following:—

Four Barred Plymouth Rock Cockerels hatched on 21st May, weighed on 22nd August following—three months—3 pounds $5\frac{1}{2}$ ounces.; 3 pounds $5\frac{1}{2}$; 3 pounds $4\frac{1}{2}$; 2 pounds $12\frac{1}{2}$. We have thus the gratifying result of two of the first mentioned birds making a combined weight of 6 pounds 11 ounces in three months.

A White Wyandotte Cockerel hatched on the 30th April weighed on the 24th September following—or four months and twenty-five days—5 pounds 15 ounces.

A White Phymouth Rock Cockerel hatched on the 6th of June weighed on 7th October following, 5 pounds 2 ounces.

Silver Laced Wyandotte Cockerel hatched on 12th May, weighed when sold on 16th October 5 pounds 4 ounces.

Coloured Dorking Cockerel, hatched 28th April, weighed on 6th November following 7 pounds.

CARE OF THE HENS DURING MOULT.

The method of caring for and feeding the hens during their moult has been described in a preceding page. Suffice to say that by the end of October the laying stock were over their moult and in satisfactory condition, The yearling hens were first to have their new feathers. At end of first week in July the male birds were removed from the breeding pens and placed by themselves in pens with runs. They will be so kept until wanted next spring for breeding purposes, of course being kept in doors during winter. During the moulting season a preparation of deodorized blood meal was used in lieu of cut green bone. The object in using the meal was, first to note whether it was as effective in the moult as were cut green bones the preceding season and secondly because it was more convenient to handle, and obtain, during the hot months, than the bone. The conclusion arrived at, after close observation, was that while satisfactory it was not quite so beneficial as the cut green bone. Further experiment will be made, if circumstances permit, another season.

COMMENCEMENT OF WINTER LAYING.

At the end of October rations of cut bone, three times per week, with a mash on two mornings of the week were resumed. Cabbage during November was fed in liberal quantity. The rations numbered two per diem with cabbage at noon. The morning ration was mash twice per week ; cut bone or grain other mornings ; cabbage at noon ; whole grain at afternoon meal. Grit, lime and drink water were supplied in abundance. The hens first to lay at end of October were Wyandottes, Barred Plymouth Rocks, Andalusians, Minorcas.

WHEN THE PULLETS LAID.

The first pullets to lay were White Plymouth Rocks and Silver Laced Wyandottes on the 25th November, followed by Barred Plymouth Rock and Andalusian pullets the day after ; Langshan on the 28th of the same month and a White Leghorn pullet on 22nd December. These pullets were all hatched at different dates in May.

EGG RECORD FOR THE YEAR.

The following is the egg record for the year 1896, by months, viz. :—

January	1,469
February	1,411
March	1,569
April	1,934
May	1,699
June	897
July	682
August	395
September	143
October	150
November	568
December	1,466
Total	12,383

LAYING STOCK.

The laying stock numbered 151 hens and 53 pullets. A number of the pullets were rather late hatched to make early layers, and several of the hens were over two years of age. They were kept principally for sitters, while a few were good as breeders, for another year. Close observation led to the conclusion that the active winter layers numbered from 120 to 130. On the 31st December, 1896, the fowls were as follows in numbers and according to description.

	Hens.	Pullets.
Barred Plymouth Rocks	8	3
White do	7	5
Silver Laced Wyandottes	12	12
White do	8	6
Light Brahmas	10	3
Langshans	11	—
Coloured Dorkings	6	—
White Leghorns	11	11
Black Minorcas	11	6
White do	6	4
Andalusians	5	3
White Javas	6	—
P. Rock-Dorking Cross	14	—
Indian Game-Langshan Cross	5	—
Golden Polands	4	—
Mixed	27	—
	151	53

AN EXPERIMENT WITH FIFTY HENS.

On the 10th of March, 1896, the writer was requested by the Agricultural Committee of the House of Commons, to set apart 50 hens of different kinds and see what could be made out of them in a year. The experiment was commenced on the 1st of April following, and is yet going on. Careful record of cost and revenue is being kept, and it is hoped to make a creditable showing at the end of the year.

MATING THE WILD GEESE.

Early in the season the wild geese were mated. Later on tame geese of the Toulouse cross were procured and mated with the wild ones—a tame gander with a wild goose, and a wild gander with a tame goose. The birds did not agree, and the eggs of the cross proved unfertile.

HEALTH OF THE STOCK.

During the year the birds suffered little from ailment of any kind. The shortened rations were not only productive of greater laying on the part of the hens, but also proved more healthful. Inquiry as to remedies for diseases of poultry, in different parts of the country, was several times made and all necessary information given. There is no doubt that over-feeding in winter, in many cases, is the cause of most of the ailments reported.

REQUIREMENTS OF THE MONTREAL POULTRY MARKET.

On 25th September I went to Montreal and saw the leading dealers in poultry and eggs. My object was to find out the demand ; what was best suited to meet that demand and the prices offered.

I found that there was a market of almost unlimited dimensions, for early chickens, called in poultry parlance "early broilers," for which one dollar, and as high as one

dollar and a half per pair was paid. To supply this demand, artificial incubation would have to be used.

A poultry dealer at Belleville, Ontario, sent a limited supply of broilers every spring to Brown Bros., but the supply was only limited. This breeder understood and regularly used incubators and brooders. Later artificially hatched poultry brought 20 cents per pound, until the poultry hatched out by farmers hens and reared on the farm came in late in August and September for which an average price of 6 cents per pound was paid. The complaint made by the dealers, as to the farmer raised poultry, was that it did not meet the requirements of their city customers.

A SUPERIOR ARTICLE WANTED.

What is wanted, the dealers said, is a superior class of birds, for table use. One dealer said to me "We have any amount of such birds as these", pointing to two large tables on which were a great number of chickens, called "culls" or "barn yard chicks," by the breeder of thoroughbreds. These chicks weighed from 3½ to 4 pounds per pair, and no effort had apparently been made to fatten, or dress them, so as to present an inviting appearance.

"Would you call a pair of chickens, weighing 8 pounds per pair, at the end of four or five months and a half—that is 4 pounds each—a superior article?" I asked a dealer. "Indeed we would" he replied, "but we get no such poultry from the farmers." "Why:" I said, "we put that weight on our Plymouth Rock, Wyandotte, Java and Langshan chickens every season on the Experimental Farm."

"I wish the farmers would do the same" remarked the dealer.

I found that for such poultry the dealers would pay 10 cents per pound to the farmer and would rather do so than pay 6 cents per pound for the inferior article.

I came to the conclusion that what our farmers wanted was a knowledge of the *breeds which made quick flesh development.* I think to the lack of this knowledge on the part of the farmer, rather than to any unwillingness or want of ability to furnish the demand, is to be attributed the scarcity of the superior article.

I learned that the poultry from the neighbourhood of Smith's Falls, Belleville and London, was the best that reached the Montreal market, and found most acceptance by the dealers, because of superior quality.

A point made by the dealers was that the poultry bred—that is the chickens reared by the farmers, developed *muscle* and *bone*, but not the quality of *flesh* required.

This has been shown in my reports for years past, to be the result of allowing the chicks to run with the mother hen, and to pick up their own living. Chickens should be carefully looked after from their hatching until they are taken to market.

NEW LAID EGGS.

I was informed that new laid eggs were hard to get in winter, and that farmers were paid as high as 40, 45 and 50 cents per dozen, the latter price being frequently paid between the 15th December and 15th February. A reliable quality of eggs for summer use is also required.

In fact the winter market for eggs is a large one, and the demand for a SUPERIOR QUALITY OF POULTRY for early market is very great.

I also saw some of the newspapers with the view of reaching the farmers through their columns, and so let them know the requirements of the Montreal market.

In conclusion permit me to remark that in view of the shipment of poultry and eggs to the English market by the government, the farmers cannot receive too much instruction as to how to get the superior quality of poultry and larger eggs required for export and home consumption.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES

REPORT OF G. W. FORREST, SUPERINTENDENT.

NAPPAN, N.S., November 30, 1896.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the following report of the operations on the Experimental Farm for the Maritime Provinces, at Nappan, N.S., during the year 1896.

WEATHER.

On 22nd November, 1895, the thermometer registered 14° of frost. The weather continued broken with intervals of frost and rain until 6th December, when a slight rain accompanied with snow and frost made fair sleighing. The thermometer registered 2° below zero on the 10th, other sleet storms occurred on the 18th and 19th, accompanied with quite heavy frost which made good sleighing. After this there was broken weather again which continued until the 5th January 1896, when the thermometer fell to 3° below zero; on the 6th, 12°; on the 7th, 5°; and on the 8th, 9th and 10th, to 3° below zero, with snow on the 13th and 14th, continuing at different periods making good sleighing until the last of March.

The thermometer registered during the coldest days of the winter months as follows:

10th January, 10° below zero; 30th, 20°; 1st February, 13°; and the 18th, 27° below zero.

The weather came in warm and the ground dried up fast from the middle of April.

The first seed was sown on the 23rd April, the ground being partially prepared on the previous day, and seeding continued with little interruption until completed. The season continued fine, with slight showers on the 9th, 19th and 20th of May, with quite a heavy rain on the 29th and 30th, being the first one of any note since the last of March. It continued showery at intervals during the whole of the growing season, with heavy rains commencing about the middle of September, continuing more or less until the middle of November, making the fall work very backward.

Frost was noticed in surrounding districts on 14th September. The first registered here was on the 12th of October, keeping mild up to the middle of November.

HAY.

Hay was about an average crop on the upland, but not up to the average on the marsh lands. The acreage in hay on the uplands was about the same as last year. The yield was as follows: upland, 30 loads; marsh (timothy), 46; broad leaf, 10 loads. Making a total yield of about 90 tons.

EXPERIMENTS WITH SPRING WHEAT.

The test plots of spring wheat, which included forty varieties, gave above the average yield. The straw was comparatively free from rust, stout and stiff. The soil was a clayey loam, the previous crop being roots. The plots were one-twentieth acre each. The seed was sown on the 25th of April at the rate of $1\frac{3}{4}$ bushels per acre, and the following results were obtained :—

WHEAT—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
			In.		In.		Bush.	Lbs.	Lbs.
Monarch	Aug. 22	120	48	Stiff	$3\frac{1}{2}$	Beardless	56	40	57
Wellman's Fife	" 29	127	48	"	4	"	50	..	57
Stanley	" 22	120	50	"	$3\frac{1}{2}$	"	49	00	61
White Russian	" 29	127	46	"	3	"	48	20	59
Goose	" 20	118	46	Medium stiff	$2\frac{1}{2}$	Bearded	47	40	64
Preston	" 22	120	40	Stiff	3	"	47	..	60
Ladoga	" 21	119	48	"	3	"	47	..	$62\frac{1}{2}$
Red Fern	" 22	120	42	Medium stiff	3	"	46	40	60
Old Red River	" 31	129	44	Stiff	3	Beardless	45	40	61
Rio Grande	" 29	127	46	"	$3\frac{1}{2}$	Bearded	45	40	60
Huron	" 31	129	45	"	3	"	45	..	61
Dawn	" 21	119	40	Medium stiff	$2\frac{1}{2}$	Beardless	45	..	60
Crown	" 31	1[illegible]9	46	Stiff	3	Bearded	44	40	60
Advance	" 22	120	42	"	$3\frac{1}{2}$	"	44	..	63
White Connell	" 31	129	46	"	3	Beardless	44	..	58
Rideau	" 21	119	42	Medium stiff	$2\frac{1}{2}$	"	43	20	60
Blenheim	" 31	129	46	"	3	Bearded	42	40	58
Percy	" 29	127	48	Stiff	3	Beardless	42	20	$57\frac{1}{2}$
Alpha	" 20	118	48	"	3	"	42	20	$61\frac{1}{2}$
Dion's	" 29	127	48	"	$3\frac{1}{2}$	Bearded	41	40	62
Pringle's Champlain	" 22	120	46	Medium stiff	3	"	41	40	59
Green Mountain	" 29	127	44	Stiff	$3\frac{1}{2}$	Beardless	41	20	60
Dufferin	" 21	119	45	Weak	3	Bearded	41	20	62
Beauty	" 31	129	46	Medium stiff	4	Beardless	40	40	58
Colorado	" 22	120	46	Stiff	3	Bearded	40	20	$61\frac{1}{2}$
Black Sea	" 21	119	48	"	3	"	39	40	$60\frac{1}{2}$
Campbell's White Chaff	" 29	127	45	"	$2\frac{1}{2}$	Beardless	39	20	59
White Fife	" 29	127	46	"	3	"	39	20	61
Gehun	" 20	118	39	Medium stiff	$2\frac{1}{2}$	"	39	..	$61\frac{1}{2}$
Captor	" 31	129	46	Stiff	3	"	38	20	59
Red Fife	" 29	127	46	"	3	"	38	..	57
Emporium	" 29	127	48	"	$3\frac{1}{2}$	Bearded	38	..	61
Progress	" 31	129	44	"	3	Beardless	37	22	60
Beaudry	" 31	129	42	Weak	3	Bearded	37	20	60
Golden Drop	" 22	120	42	Medium stiff	$2\frac{1}{2}$	Beardless	36	40	60
Countess	" 31	129	42	"	$2\frac{1}{2}$	"	34	40	61
Vernon	" 31	129	42	"	$2\frac{1}{2}$	Bearded	33	20	61
Herisson Bearded	" 31	129	42	"	2	"	32	..	61
Admiral	" 31	129	44	Stiff	3	Beardless	31	40	59
Hungarian	" 31	129	40	Weak	3	Bearded	31	40	60

NOTE.—The weights per bushel given here, and also in all other grain tables in this report, were taken as the grain came from the threshing mill, and are not the maximum weights that the grain could be brought to by cleaning.

EXPERIMENTS WITH BARLEY.

The experimental plots of barley consisted of thirty-six varieties ; nineteen of six-rowed sorts and seventeen of two-rowed.

The straw was comparatively free from rust, but quite a number of varieties were more or less affected with smut. The grain was hardly up to the average in yield, due principally to the young plants being killed back somewhat by a frost in the latter part of May.

The soil chosen for the test of the six-rowed varieties was a clayey loam, the previous crop being roots. For the two-rowed sorts, the soil was a rather sandy loam on which the previous crop was timothy and clover. This was ploughed in the spring and a barrel of complete fertilizer used per acre, being drilled in with the seed and all the varieties were sown 9th May at the rate of two bushels per acre in one-twentieth acre plots. The results obtained are found in the following table :—

TWO-ROWED BARLEY—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.
			Inches.		Inches.	Bush.	Lbs.	Lbs.
Nepean	Aug. 28	111	44	Very stiff	3	42	4	52
Prize Prolific	do 28	111	34	Medium stiff	3	33	16	52
Beaver	do 22	105	36	do	4	33	16	54
Thanet	do 28	111	30	Weak	3½	32	14	52
California Prolific	do 28	111	38	Stiff	3	31	12	51
French Chevalier	do 28	111	34	Medium stiff	3½	31	12	52
Duckbill	do 22	105	40	Stiff	3	28	36	51
Pacer	do 28	111	42	Very stiff	3½	28	16	52
Bolton	do 20	103	36	Medium stiff	3½	27	44	53
Victor	do 27	110	36	do	3	26	32	53
Sidney	do 27	110	40	do	3½	26	32	52
Danish Chevalier	do 28	111	34	do	3½	26	32	53
Kinver Chevalier	do 28	111	30	Weak	2½	26	12	53
Newton	do 28	111	36	Stiff	3	22	4	52
Rigid	do 28	111	40	do	3	19	8	52
Canadian Thorpe	do 28	111	40	do	2¾	17	24	51
Monck	do 28	111	38	do	3	17	10	54

SIX-ROWED BARLEY—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.
			Inches.		Inches.	Bush.	Lbs.	Lbs.
Mensury	Aug. 14	97	40	Stiff	3½	61	32	52
Surprise	do 27	110	42	do	2½	56	32	52
Nugent	do 27	110	40	do	2½	47	44	51
Champion	do 11	94	40	do	3	47	44	48
Trooper	do 27	110	42	do	2½	47	44	51
Success	do 11	94	33	Medium stiff	2½	44	20	45
Summit	do 27	110	42	Stiff	2½	42	4	51
Stella	do 27	110	42	do	2½	42	4	51
Excelsior	do 11	94	34	Medium stiff	2½	38	8	42
Oderbruck	do 14	97	33	do	3	37	4	53
Vanguard	do 14	97	36	do	3½	37	4	50
Baxter's	do 27	110	40	Stiff	2¼	36	12	53
Pioneer	do 22	105	36	Medium stiff	2½	30	..	50
Royal	do 20	103	34	Weak	3	29	8	51
Phœnix	do 14	97	40	Stiff	2¾	26	12	51
Common	do 27	110	36	Medium stiff	2½	25	40	50
Odessa	do 20	103	38	do	2¾	22	44	48
Rennie's Improved	do 14	97	36	do	2½	17	44	50
Petschora	do 22	105	34	do	2½	17	44	45

SUMMARY.

Average yield of all the six-rowed varieties for 1896—37 bushels 15 lbs. Average yield of all the two-rowed varieties for 1896—29 bushels 8 lbs.

Average yield from experiments conducted with six-rowed varieties of barley for the past three years, of five of the most promising varieties :—

	Bush.	Lbs.
Mensury	46	42
Surprise	41	12
Trooper	39	8
Summit	35	..
Oderbruch	31	45

Average yield from experiments conducted with two-rowed varieties of barley for the past three years, of five of the most promising varieties :—

	Bush.	Lbs.
French Chevalier	38	29
Kinver Chevalier	34	..
Bolton	32	24
Canadian Thorpe	31	84
Sidney	31	41

EXPERIMENTS WITH OATS.

Sixty varieties of oats were sown in plots of one-twentieth acre each, on the 5th of May. The straw, except in a few of the later ripening sorts, was quite free from rust. Some varieties were badly smutted, others only slightly.

The soil on which these varieties were tested was a clay loam, the previous crop being wheat and oats. A barrel of complete fertilizer was used per acre. The results were as follows :—

OATS—Test of Varieties.

Name of variety.	Date of Ripening.		Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per acre.		Weight per Bushel.
				In.		In.		bus.	lbs.	Lbs
Pense	Aug.	21	109	46	Stiff	9	Sided	104	24	37
Banner	do	18	106	45	do	8	Branching	99	14	38½
White Schonen	do	18	106	46	do	8	do	97	2	37½
Buckbee's Illinois	do	22	110	46	do	8	do	95	30	36
Mennonite	do	22	110	42	do	7	do	93	..	36
Master	do	22	110	48	do	9	do	90	..	36
Russell	do	22	110	48	do	9	do	89	14	38
Oxford	do	22	110	48	do	9	do	88	28	40
Joanette	do	22	110	36	do	7	do	88	8	35
White Russian	do	18	106	45	Medium do.	8	do	88	8	39
Olive	do	22	110	48	Stiff	9	do	86	..	39
King	do	18	106	48	Medium do.	8	do	85	10	37
Wide Awake	do	18	106	45	do	7½	do	84	24	35
Early Blossom	do	21	109	48	Stiff	9	Sided.	84	24	40
Oderbruch	do	20	108	45	do	9	Half-sided	84	21	37
Early Etampes	do	22	110	36	do	7	Branching	84	14	35
American Triumph	do	31	119	50	do	9	do	84	4	38
Improved Ligowo	do	18	106	45	Medium do.	7	do	84	4	43
Medal	do	22	110	48	Stiff.	8	do	83	18	38
Columbus	do	18	106	50	Very do.	7	do	83	18	35
Cal. Prolific Black	do	18	106	50	do	9	Sided.	83	18	37
Coulommiers	do	31	119	42	Medium do.	8	Branching	83	18	[illegible]

OATS—Test of Varieties—*Concluded.*

Name of variety.	Date of Ripening.		Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per acre.		Weight per Bushel.
				In.		In.		bus.	lbs.	Lbs.
Rosedale	do	20	108	48	Stiff.	8	Sided.	82	32	36½
Brandon	do	22	110	48	do	9	Half-sided	82	12	38
Wallis	do	18	106	40	Medium do.	8	Branching	82	12	41
Bonanza	do	18	106	43	Weak	9	do	81	6	39½
Cromwell	do	22	110	42	Stiff.	8	do	79	14	38
Lincoln	do	18	106	42	Medium do.	7	do	79	14	37
Early Maine	do	22	110	46	Stiff.	9	do	77	22	37
Gothland	do	21	109	44	do	8	Sided.	77	18	37
Abyssinia	do	18	106	48	do	9	do	77	2	37
American Beauty	do	20	108	46	Medium do.	8	Branching	76	16	40
Golden Beauty	do	18	106	44	do	8	do	76	16	41
Miller	do	18	106	44	do	8	do	74	4	40
Giant Cluster	do	31	119	48	Stiff.	9	Sided.	74	4	35½
Prolific Black Tartarian	do	18	106	50	Very do.	8	do	72	32	35
Holstein Prolific	do	21	109	48	Stiff.	8	Branching	72	..	36
Golden Giant	do	31	119	46	do	10	Sided.	71	6	41
Abundance	do	21	109	48	do	8	Branching	70	20	36
Cream Egyptian	do	18	106	48	Very do.	9	Sided.	69	14	40
White Monarch	do	18	106	44	Stiff.	9	Branching	67	22	41
Imported Irish	do	11	99	45	Medium do.	10	do	67	22	42
Flying Scotchman	do	18	106	48	Stiff.	10	do	66	6	42
Early Racehorse	do	12	100	48	do	9	do	65	30	40
Early Archangel	do	18	106	46	Medium do.	9	do	65	30	40
Challenge	do	21	109	42	do	9	do	64	24	40
Doncaster Prize	do	18	106	40	Stiff.	10	do	62	16	40
Scotch Hopetoun	do	21	109	48	do	9	do	62	..	39
Rennie's Prize	do	12	100	43	do	8	do	61	26	42
Winter Grey	do	20	108	44	Medium do.	8	do	61	26	40
Poland White	do	12	100	40	Stiff.	8	do	60	20	40
Hazlett's Seizure	do	21	109	40	Medium do.	8	do	58	28	36
Welcome	do	21	109	40	do	8	do	58	28	36
Scottish Chief	do	20	108	36	Weak	8	do	55	30	37
Prize Cluster	do	21	109	42	Stiff.	10	do	50	..	38
Victoria Prize	do	21	109	42	do	10	do	50	..	41
Siberian	do	31	119	48	do	9	Sided.	49	14	39
White Wonder	do	18	106	42	Medium do.	8	Branching	47	2	40
Bavarian	do	18	106	42	Stiff.	7	do	38	28	43
Early Golden Prolific	do	18	106	42	do	8	do	33	18	42

SUMMARY.

Average yield of all the oat plots for the season of 1896—73 bushels 14 pounds per acre.

The average yield per acre from five years' experiments with seven of the most promising varieties has been:

	Bush.	Lbs.	Weight per bushel.
Early Blossom	68	13	39
Prolific Black Tartarian	67	6	37
Banner	67	2	39
Cream Egyptian	65	23	41
Joanette	65	4	37
Abyssinia	64	22	40
Early Gothland	59	4	40

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

Experiments to test the relative value of early, medium and late sowing were again carried on this year.

The first of these plots was sown on the 27th April. The size of the plots was $\frac{1}{20}$ acre each; one week intervening between each of the six sowings. The soil was of a sandy loam; the previous crop being corn. No rust was observed in the first four series of plots, the later sown ones were quite badly rusted,

There were two plots each of wheat, barley and oats. The following results were obtained:—

OATS—Results of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of ripening.	No. of days maturing.	Length of straw.	Character of straw.	Length of head.	Yield per acre.		Weight per bushel.	Proportion rusted.
				In.		In.	Bush.	lbs.	Lbs.	
No. 1—										
Banner	April 27	Aug. 21	117	48	Stiff	9	108	8	35	None.
Abundance	do 27	do 21	117	48	do	8	80	20	35	do
No. 2—										
Banner	May 4	do 25	115	46	do	9	98	8	38	do
Abundance	do 4	do 25	115	46	do	8	78	37	37	do
No. 3—										
Banner	do 11	do 29	110	45	do	9	97	22	37	do
Abundance	do 11	do 29	110	44	do	8	72	32	36	do
No. 4—										
Banner	do 18	Sept. 5	111	45	do	9	64	24	35	do
Abundance	do 18	do 5	111	45	do	8	72	32	39	do
No. 5—										
Banner	do 25	do 10	109	45	do	9	87	2	36	Slightly.
Abundance	do 25	do 10	109	43	do	8	71	6	38	do
No. 6—										
Banner	June 1	do 14	106	46	do	9	25	30	31	Badly.
Abundance	do 1	do 14	106	46	do	8	37	22	32	do

BARLEY—Results of Early, Medium and Late Sowings.

No. 1—										
Odessa	April 27	Aug. 21	117	36	Med. stiff.	3	33	16	50	Some smut.
Canadian Thorpe	do 27	do 21	117	44	Stiff	3	29	8	52	do
No. 2—										
Odessa	May 4	Sept. 1	120	32	Med. stiff.	2½	23	16	50	Some smut.
Canadian Thorpe	do 4	do 1	120	36	Stiff	3	21	12	50	None.
No. 3—										
Odessa	do 11	do 6	118	32	Med. stiff.	2½	19	28	46	Slight smut.
Canadian Thorpe	do 11	do 6	118	36	Stiff	3	24	8	49	do
No. 4—										
Odessa	do 18	do 10	116	30	Med. stiff.	3	32	24	48	do
Canadian Thorpe	do 18	do 10	116	36	Stiff	3	24	8	54	do
No. 5—										
Odessa	do 25	oo 14	109	30	Med. stiff.	3	36	32	48	Some rust.
Canadian Thorpe	do 25	do 14	109	34	Stiff	3	41		53	do
No. 6—										
Odessa	June 1	do 16	108	30	Med. stiff.	3	32	24	......	Badly rusted.
Canadian Thorpe	do 1	do 16	108	34	Stiff	3	20	40	......	do

WHEAT—Results of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of ripening.	No. of days maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				In.		In.	Bush.	lbs.	Lbs.	
No. 1—										
Red Fife	April 27	Aug. 28	125	44	Stiff	3½	34	40	60½	None.
Stanley	do 27	do 28	125	42	do	3	28		60	do
No. 2—										
Red Fife	May 4	Sept. 1	120	46	do ...	3	30	40	59	do
Stanley	do 4	do 1	120	38	do	3	17	20	59	do
No. 3—										
Red Fife	do 11	do 8	121	46	do	3	23		58	do
Stanley	do 11	do 8	121	40	do	3	18	40	59	do
No. 4—										
Red Fife	do 18	do 12	118	46	do	3	32		57	do
Stanley	do 18	do 12	118	44	do	3	22	20	55	do
No. 5—										
Red Fife	do 25	do 16	114	44	do	3	25	40	57	Slightly.
Stanley	do 25	do 16	114	46	do	3	25		57	do
No. 6—										
Red Fife	June 1	do 21	113	42	Med. stiff.	3	20	40	56	Badly.
Stanley	do 1	do 21	113	42	do .	3	23	20	53	do

SUMMARY.

Results for the period of six years' test of the early, medium and late sowings of all varieties :—

	Oats.		Barley.		Wheat.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
1st sowing, average of eleven tests........	49	31	26	21	19	47
2nd do do do do	52	9	28	3	20	53
3rd do do do do	58	14	29	16	19	40
4th do do do do	52	17	28	10	16	53
5th do do nine do	47	29	27	2	19	10
6th do do do do	42	20	23	22	18	8

EXPERIMENTS WITH PEASE.

Twenty-five varieties of pease were sown 6th May, on one-twentieth acre plots. The soil was a light clay loam; the previous crop was oats. One barrel of complete fertilizer was used per acre, and the following results were obtained.

PEASE—Test of varieties.

Name of Variety.	Date of ripening.	Number of days maturing.	Character of growth.	Length of straw.	Length of pod.	Size of pea.	Yield per acre.		Weight per bushel.
				In.	In.		Bush.	lbs.	Lbs.
Crown	Aug. 22	108	Strong	34	2	Small	51		64
Large White Marrowfat	do 27	113	Very strong	46	3	Medium	47		61
Bedford	do 28	114	Strong	44	2¼	do	47		60
Carleton	do 28	114	Very strong	56	2½	do	45	40	61
Daniel O'Rourke	do 27	113	Strong	36	2	Small	45	20	63
Paragon	do 27	113	do	44	2	do	45		62
Creeper	do 27	113	do	42	2	do	45		60
Agnes	do 28	114	do	40	2½	Medium	45		63
Prince	do 28	114	do	42	2	do	45		62
Pride	do 25	111	do	40	3	Large	44	20	63
Macoun	do 27	113	Very strong	56	2½	do	44	20	61
Kent	do 28	114	do	48	2½	Medium	40	40	62
Arthur	do 22	108	Strong	34	2	Small	40	40	64
Duke	do 28	114	do	44	3	Medium	40	20	64
Mackay	do 27	113	Very strong	50	2½	do	40		63
Bruce	do 27	113	do	46	3	do	40		63
Black Eyed Marrowfat	do 27	113	Strong	46	2½	Large	39	20	62½
Centennial	do 25	111	Very strong	42	2	Medium	35	40	64
New Potter	do 25	111	do	48	2	do	35	20	61
Trilby	do 22	108	Strong	30	2¼	Small	31	20	63
Prince Albert	do 25	111	do	40	2	do	30		63
Multiplier	do 25	111	do	35	2	do	30		62½
Golden Vine	do 22	108	do	30	1¾	do	27	40	64½
Mummy	do 21	107	do	36	2	Medium	24	40	62
Canadian Beauty	do 21	107	do	34	2½	Large	22		62

SUMMARY.

Average yield of pease per acre, from four years' test of six of the most promising varieties:—

	Bush.	Lbs.
Black Eyed Marrowfat	45	15
Crown	42	45
Pride	40	20
Multiplier	38	28
Prince Albert	38	28
Canadian Beauty	37	

EXPERIMENTS WITH TURNIPS.

Fourteen varieties of turnips were sown in this test. The land used for this experiment was a clayey loam. The crop of last season was oats, the land was ploughed in the fall, and twenty-five 30-bushel cart loads of barnyard manure, and 300 pounds of complete fertilizer, were used per acre. Two sowings were made of each variety. The first set of plots were sown on 22nd May and the second on 5th June.

The yield of all roots per acre has been calculated from the quantity obtained from three rows, each 66 feet long and 28 inches apart. The following results were obtained :—

TURNIPS—Test of varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
					Ton.	lbs.	Bus.	lbs.	Ton.	lbs.	Bus.	lbs.
Purple Top Swede	May 22.	June 5.	Oct. 23	Oct. 23.	38	1550	1292	30	35	500	1175	
Perfection	do 22.	do 5.	do 23.	do 23.	37	1200	1253	20	29	750	979	10
Hartley's Bronze	do 22.	do 5.	do 23.	do 23.	34	150	1135	50	32	1800	1096	40
Mammoth Clyde	do 22.	do 5.	do 23.	do 23.	34	150	1135	50	34	150	1135	50
Selected Champion.....	do 22.	do 5.	do 23.	do 23.	34	150	1135	50	29	1690	994	50
Carter's Elephant	do 22.	do 5.	do 23.	do 23.	34	150	1135	50	35	500	1175	
Skirving's	do 22.	do 5.	do 23	do 23.	32	1800	1096	40	29	750	979	10
Marquis of Lorne	do 22.	do 5.	do 23.	do 23.	30	1450	1024	10	30	1100	1018	20
Sutton's Champion.............	do 22.	do 5.	do 23.	do 23.	30	1450	1024	10	30	1570	1026	10
Jumbo or Monarch.............	do 22.	do 5.	do 23	do 23.	29	1690	994	50	30	1100	1018	20
Giant King	do 22.	do 5.	do 23.	do 23.	29	400	970		29	400	970	
East Lothian	do 22.	do 5.	do 23.	do 23.	28	1140	952	30	29	750	979	10
Prize Winner	do 22.	do 5.	do 23.	do 23.	28	400	940		32	1800	1096	40
Prize Purple Top................	do 22.	do 5.	do 23	do 23	27	990	916	30	31	1450	1057	30

EXPERIMENTS WITH MANGELS.

Thirteen varieties of mangels were under test during the past season. The soil was of the same character as that used for the turnip plots, and two sowings were made of each variety. The following results were obtained :—

MANGELS—Test of varieties.

Name of variety.	1st plot sown.	2nd plot sown.	1st plot pulled.	2nd plot pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
					Ton.	lbs.	Bus.	lbs.	Ton.	lbs.	Bus.	lbs.
Warden Orange Globe...........	May 22.	June 5.	Oct. 23.	Oct. 23.	33	1200	1120	.	24	1000	816	40
Yellow Intermediate............	" 22.	" 5.	" 23.	" 23	29	1500	991	10	32	750	1079	10
Mammoth Long Red (Evans) ...	" 22.	" 5.	" 23.	" 23.	29	575	976	15	21	1800	730	..
Giant Yellow Globe....	" 22.	" 5.	" 23.	" 23.	29	400	973	20	24	1285	821	25
Giant Yellow Intermediate......	" 22.	" 5.	" 23	" 23.	28	940	949	..	25	1100	851	40
Mammoth Long Red (Webb)....	" 22.	" 5.	" 23.	" 23.	27	750	912	30	23	720	778	40
Gate Post	" 22.	" 5.	" 23.	" 23.	27	250	904	10	26	500	875	..
Red Fleshed Globe.	" 22.	" 5.	" 23.	" 23.	26	925	882	5	21	1800	730	..
Mammoth Long Red (Steele)....	" 22.	" 5.	" 23.	" 23.	25	1100	851	40	21	1800	730	..
Champion Yellow Globe.........	" 22.	" 5.	" 23.	" 23.	24	545	809	5	20	150	669	10
Golden Fleshed Tankard........	" 22.	" 5.	" 23	" 23.	23	550	775	50	26	500	875	..
Canadian Giant................	" 22.	" 5.	" 23.	" 23.	21	1500	725	..	26	500	875	..
Red Fleshed Tankard...........	" 22.	" 5.	" 23.	" 23.	20	1245	687	25	18	1230	620	30

EXPERIMENTS WITH CARROTS.

Fourteen varieties of carrots were under test in 1896. They were sown on land similar in character to that used for the turnip plots and received the same cultivation and manuring. Two sowings were made of each variety. The following results were obtained :—

CARROTS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
					Ton.	lbs.	Bus.	lbs.	Ton.	lbs.	Bus.	lbs.
Mammoth White Intermediate..	May 22.	June 5.	Oct. 20.	Oct. 20.	19	1950	665	50	18	1600	626	40
Improved Short White..........	" 22.	" 5.	" 20.	" 20.	19	540	642	20	18	1050	650	10
Half Long White.......... ..	" 22.	" 5.	" 20.	" 20.	18	1600	626	40	14	200	470	
Half Long Chantenay..........	" 22.	" 5.	" 20.	" 20.	18	1050	650	10	12	1850	430	50
Early Gem....................	" 22.	" 5.	" 20.	" 20.	17	1300	587	80	14	200	470	
Guerande or Oxheart...........	" 22.	" 5.	" 20.	" 20.	17	1250	587	50	14	200	470	
Iverson's Champion............	" 22.	" 5.	" 20.	" 20.	17	1250	587	30	15	550	509	10
White Belgian.................	" 22.	" 5.	" 20.	" 20.	16	900	548	20	12	1850	430	50
Carter's Orange Giant....... ..	" 22.	" 5.	" 20.	" 20.	16	900	548	20	9	800	313	20
Giant White Vosges...........	" 22.	" 5.	" 20.	" 20.	15	550	509	10	11	1500	391	40
Long Scarlet Altringham........	" 22.	" 5.	" 20.	" 20.	14	200	470	..	11	1500	391	40
Giant Yellow Intermediate.. ..	" 22.	" 5.	" 20.	" 20.	14	200	470	..	10	1150	352	30
Surrey or Long Orange.........	" 22.	" 5.	" 20.	" 20.	11	1500	391	40	10	210	336	50
Scarlet Intermediate...........	" 22.	" 5.	" 20.	" 20.	10	210	336	50	11	1500	391	40

EXPERIMENTS WITH SUGAR BEETS.

Five varieties of sugar beets were sown on the 22nd of May. These were pulled October 17th. These plots were adjoining the turnip, carrot and mangel plots. The soil was of the same character and the land was prepared in a similar manner. The following results were obtained :—

Name of Variety.	Yield per Acre.			
	Tons.	Lbs.	Bush.	Lbs.
Lane's Sugar.. ..	20	1250	687	30
Green Top White Sugar..	19	1875	664	35
Austrian Electoral..	19	1875	664	35
Red Top Sugar..	17	375	572	55
Vilmorin's Improved..	15	250	504	10

EXPERIMENTS WITH POTATOES.

One hundred varieties of potatoes were planted on the 20th May, on a loamy soil, which was in barley the previous season, it was ploughed in the fall of 1895. In the spring twenty 30-bushel cart loads of barnyard manure and 300 pounds of complete fertilizer were used per acre.

All the plots were treated during the season with the Bordeaux mixture, and no rotten ones were found in the plots dug on the 21st and 24th September, but those dug on the 9th and 10th October were in many cases badly rotted.

The yield per acre has been calculated in each case from the weight of tubers gathered from two rows, each 66 feet long. The following results were obtained :—

POTATOES—Test of varieties.

Name of Variety.	Dug.	Yield per Acre.									
		Total.		Sound.		Rotten.		Marketable.		Unmarketable.	
		Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.
Seedling No. 230	Sept. 24	583		583				501	20	81	40
Early Puritan	Oct. 9	560		479		81	40	420		140	
Ritchter's Rose	" 9	560		455		105		420		140	
Pride of the Market	" 10	560		420		140		361	40	198	20
Green Mountain	" 9	548	20	478	20	70		408	20	140	
Holborn Abundance	" 10	536	40	494	40	42		466	40	70	
Empire State	" 9	536	40	501	40	35		455		81	40
Irish Daisy	Sept. 24	529	40	529	40			494	40	35	
Thorburn	Oct. 10	525		455		70		373	20	151	40
Burbank	" 10	513	20	371		142	20	303	20	210	
Late Puritan	" 10	513	20	345	20	168		291	40	221	40
Burnaby's Seedling	" 9	511		...				469		42	
Dreer's Standard	" 10	501	40	424	40	77		350		151	40
Carman No. 1	" 9	501	40	...				466	40	35	
Beauty of Hebron	" 9	499	20	417	40	81	40	359	20	140	
Money Maker	Sept. 24	493	40	...		...		445	40	28	
Crown Jewel	Oct. 9	492	20	...		...		452	40	39	40
I.X.L	Sept. 21	490		...		...		429	20	60	40
Charles Downing	Oct. 9	490		467		23		408	20	81	40
Mackenzie	" 9	490		469		21		420		70	
Russell's Seedling	" 10	490		469		21		420		70	
Northern Spy	" 10	478	20	455		23	20	408	20	70	
Rose's New Giant	" 9	478	20	385		93	20	350		128	20
General Gordon	" 9	471	20	389	40	81	40	350		121	20
Daisy	Sept. 24	473	40	...		...		408	20	65	20
World's Fair	Oct. 10	466	40	298	40	168		233	20	233	20
Queen of the Valley	" 10	466	40	326	40	140		233	20	233	20
Reading Giant	" 9	462		429	20	32	40	392		70	
Pearce's Prize Winner	Sept. 21	459	40	...		...		420		39	40
White Beauty	Oct. 9	457	20	...		...		410	40	46	40
Lizzie's Pride	" 10	455		361	40	93	20	315		140	
Abbott	" 10	455		373	20	81	40	350		105	
Rural Blush	" 10	455		...		...		408	20	46	40
Seattle	" 9	452	40	...		...		410	40	42	
Dakota Red	Oct. 9	445	40	...		...		408	20	37	20
Troy Seedling	" 10	443	20	373	20	70		326	40	116	40
Prize Taker	" 10	443	20	410	40	32	40	373	20	70	
Early White Prize	" 9	443	20	350		93	20	303	20	140	
Rural New Yorker No. 2	" 10	443	20	...		...		373	20	70	
Polaris	Sept. 21	441	40	...		...		396	40	35	
Stray Beauty	" 24	441		...		...		410	40	30	20
Clarke's No. 1	" 21	433	20	...		...		373	20	60	
Copper	" 21	431	40	...		...		338	20	93	20
Stourbridge Glory	" 21	431	40	...		...		350		81	40
Chicago Market	Oct. 10	429	20	...		...		396	40	32	40
Early Norther	" 9	420		...		...		373	20	46	40
Record	" 10	420		373	20	46	40	315		105	
New Queen	" 9	420		385		35		350		70	
Great Divide	" 9	415	20	...		...		361	40	53	40
Victor Rose	" 9	415	20	382	40	32	40	338	20	77	
Lee's Favourite	Sept. 21	413		...		...		350		63	
Delaware	" 24	413		...		...		361	40	51	20
Early Six Weeks	" 21	410	40	...		...		345	20	65	20
Muchonic	" 21	410	40	...		...		387	20	23	20
Dixon's Early	" 21	410		...		...		350		60	
American Wonder	Oct. 9	408	20	...		...		359	20	49	
Peerless Junior	" 10	408	20	...		...		361	40	46	40
Vanier	" 9	408	20	...		...		350		58	20
Early Sunrise	Sept. 21	408	20	...		...		373	20	35	
Sugar	Oct. 9	399		238	20	60	40	256	40	142	20

POTATOES—Test of Varieties—*Concluded.*

Name of Variety.	Dug.	Yield per Acre.									
		Total.		Sound.		Rotten.		Marketable.		Unmarketable.	
		Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.
Orphans	" 9	396	40	343		53	40	303	20	93	20
Hopeful	" 10	396	40	380	20	16	20	326	40	70	
Early Harvest	" 9	396	40	388		8	40	315		81	40
London	" 9	382	40	350		32	40	303	20	79	20
Hale's Champion	" 9	382	40	357		25	40	303	20	79	20
Clay Rose	" 9	380	20	....		....		350		30	20
Maggie Murphy	Sept. 24	380	20	....		....		338	20	42	
Richter's Elephant	" 24	380	20	....		....		338	20	42	
Toronto Queen	Sept. 21	380	20	....		....		326	40	53	40
Late Goodrich	Oct. 10	373	20	330		43	20	280		93	20
Early Ohio	Sept. 21	368	40	....		....		315		53	40
Jerusalem	" 21	364		....		....		343		21	
Pope	Oct. 10	361	40	311		50	40	280		81	40
Freeman	" 9	361	40	275		86	40	256	40	105	
Vick's Extra Early	" 9	361	40	282	20	79	20	245		116	40
Harbinger	" 10	361	40	305	40	56		233	20	128	20
Ideal	" 10	361	40	....		....		326	40	35	
Wonder of the World	Sept. 21	361	40	....		....		315		46	40
Table King	Oct. 9	354	40	....		....		303	20	51	20
Acadian	Sept. 21	350		....		....		303	20	46	40
Early Rose	" 21	338	20	....		....		303	20	35	
Home Comfort	" 24	333	40	....		....		259		74	40
Sharpe's Seedling	Oct. 10	332		....		....		268	20	53	40
Richter's Imperial	Sept. 21	326	40	....		....		280		46	40
Brownell's Winner	" 24	326	40	....		....		291	40	35	
Henderson's Late Puritan	Oct. 9	308		....		....		256	40	51	20
Everett	" 10	280		271		9		210		70	
Compton's Surprise	" 10	280		269		11		210		70	
Pride of the Table	" 10	273		231		42		186	40	86	20
Satisfaction	" 9	273		....		....		231		42	
Algoma, No. 1	Sept. 21	256	40	....		....		233	20	23	20
New Variety, No. 1	Oct. 9	254	20	....		....		233	20	21	
Pearce's Extra Early	Sept. 21	242	40	....		....		200	40	42	
Lightning Express	" 24	238		....		....		210		28	
Seedling, No. 214	Oct. 9	237		201	40	35	20	151	40	85	20
Brown's Rot Proof	" 9	235		....		....		210		25	
Rosy Morn	" 9	233	20	....		....		210		23	20
Kidney	Sept. 21	224		....		....		200	40	23	20
Burpee's Extra Early	" 21	168		....		....		140		28	
Earliest of All	" 21	168		....		....		140		28	

EXPERIMENTS WITH INDIAN CORN.

Twenty varieties of Indian corn were sown on the 22nd of May on a light loamy soil in rows 3 feet apart with the plants about one foot apart in the rows and a duplicate set of plots were planted side by side in hills, three feet apart each way. The following results were obtained :—

INDIAN CORN—TEST OF VARIETIES.

Name of Variety.	Character of growth.	Height.	When tasselled.	In silk.	Early milk.	Late milk.	Condition when cut.	Weight per acre grown in rows.	Weight per acre grown in hills.
		In.						T'ns. lbs.	T'ns. lbs.
Cuban Giant	Very strong.	108	Sept. 4	Sept. 11	....	....	Early milk	20 975	21 1010
Thorougbred White Flint	" .	108	" 1	" 10	....	....	Late milk.	19 1050	18 1510
Sanford	" .	96	Aug. 25	" 1	Sept. 8	.. ..	" .	18 850	19 775
Mastodon	" .	108	Sept. 10	....	....	....	Silk	18 850	17 1200
Pride of the North ...	" .	108	" 4	Sept. 11	....	....	Early milk	17 1310	16 1440
Leaming	Strong......	108	" 15	....	....	....	Tasselled..	17 650	15 1075
Compton's Early......	"	96	Aug. 20	Aug. 28	Sept. 1	Sept. 9	Glazed ...	17 630	21 350
Longfellow	"	90	" 20	" 28	" 1	" 9	"	16 725	18 850
Canada White Flint..	Fair........	84	" 23	" 29	" 8	....	Late milk.	16 560	20 1030
Angel of Midnight....	Strong......	96	" 20	" 28	" 1	Sept. 9	Glazed ...	16 175	17 1090
Pearce's Prolific . .	"	90	" 20	" 28	" 1	" 9	"	16 175	17 630
King of the Earliest ..	Very strong.	96	Sept. 1	Sept. 10	....	....	Late milk.	15 1350	12 1310
Mammoth Eight-Rowed Flint.. ...	Fair........	84	Aug. 25	Aug. 31	Sept. 8	....	Early milk	14 1700	15 1515
Champion White Pearl	Very strong.	108	Sept. 1	Sept. 8	....	....	Late milk.	14 1590	15 1735
Giant Prolific Ensilage	Fair........	84	" 19	....	....	....	Tasselled..	14 1150	12 1300
Early Huron Dent....	Strong......	96	Aug. 20	Aug. 28	Sept. 1	Sept. 9	Glazed ...	12 1850	12 1575
Red Cob Ensilage.....	Fair	84	Sept. 19	....	....	....	Tasselled..	12 640	16 1825
White Cap Yellow Dent	Strong......	96	Aug. 27	Sept. 8	.. ....	....	Late milk.	12 640	15 140
Mitchell's Extra Early	Weak	60	" 20	Aug. 25	Sept. 1	Sept. 10	Glazed ...	11 825	9 1525
Country Gentleman...	Fair........	72	Sept. 3	Sept. 10	.. ....	....	Early milk	7 1840	8 1875

Average yield per acre from corn sown in rows and hills :

	Tons.	Lbs.
Sown in hills, 1896...........................	15	1,253
Sown in rows, 1896..	15	1,026

PREPARING OF LAND FOR CORN.

To determine the effect of the different modes of preparing soils for corn crops, a series of experiments were planned in the fall of 1895.

These were conducted on a timothy and clover sod field of $\frac{1}{3}$ acre each plot, except in plot No. 5, when a $\frac{2}{3}$ acre plot was used. The soil was a sandy loam. The corn was drilled in with the "Wisner" seed drill, all of the seed spouts being closed except two, making the rows 3 feet apart. Fertilizer was drilled in through all the spouts, 250 pounds per acre being used. The corn was sown on the 22nd of May, and cut on the 25th and 26th of September.

No. 1.

Fall ploughed.—Worked up in the spring and 250 pounds of complete fertilizer per acre drilled in with the corn. Yield per acre, 12 tons 120 pounds.

No. 2.

Fall ploughed.—Thirty 30 bushel cart loads of barnyard manure per acre was spread on after the land was ploughed in the fall and worked in before seeding in the spring. Yield per acre, 13 tons.

No. 3.

Spring ploughed.—Worked up after ploughing and 250 pounds of complete fertilizer per acre was drilled in with the corn. Yield per acre, 11 tons 680 pounds.

No. 4.

Spring ploughed.—Thirty 30 bushel cart loads of barnyard manure per acre was spread on after ploughing and worked in before seeding. Yield per acre, 14 tons 800 pounds.

No. 5.

Spring ploughed.—Thirty 30 bushel cart loads of manure was applied to this land, being spread on the sod in the fall of 1895. This was ploughed in and worked up in the spring before seeding. Yield per acre, 17 tons.

GRAIN CROPS WITH AND WITHOUT CLOVER.

To ascertain whether the sowing of 10 pounds of Mammoth Red Clover per acre with the grain crop will affect the yield of the grain ; also whether after the grain is cut the clover will grow sufficiently strong to furnish a fair mat of foliage for ploughing under, and how the clover will succeed when sown with each of these crops, experiments were conducted on one-quarter acre plots with ten varieties of grain, making a total of $2\frac{1}{2}$ acres sown with clover and $2\frac{1}{2}$ acres without clover. This experiment was conducted on a fairly even piece of land of poor quality ; one barrel of complete fertilizer was drilled in with the grain, per acre. The clover made poor growth, no difference could be noticed in the growth when sown with the different kinds of grain except in the pea plots where the clover was almost entirely killed out. The yields obtained are given in the following table. These plots were sown on 7th May.

CLOVER AND CHECK PLOTS OF OATS, WHEAT, PEASE AND BARLEY.

Name of Variety.	Date of Ripening.	Seeded with Clover			Not Seeded with Clover.		
		Yield per Acre.		Weight per Bushel.	Yield per Acre.		Weight per Bushel.
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
Bolton	Aug. 11..	22	12	50	27	28	53
French Chevalier	" 20..	41	40	46	35	8	46
Trooper	" 11..	20	24	49	25	..	49
Odessa	" 20..	22	44	46	20	16	42
Banner	" 20..	61	26	37	65	30	39
Abundance	" 20..	54	24	37	53	..	37
Red Fife	" 31..	20	28	59	15	20	61
Preston	" 31..	21	44	61	26	52	62
Crown	" 18..	19	32	65	30	12	65
Canadian Beauty	" 18..	18	8	65	20	28	64

From the results of this course of experiments it does not appear that the sowing of the clover with the grain had any material effect in the way of reducing the yield of the cereal.

EXPERIMENTS WITH FLAX.

Eight one-tenth acre plots of flax were sown on rather a light loamy soil. Two of these plots were sown on the 14th May and two each week following until the whole were sown. The quantity of seed sown was as follows: 4 pounds per plot, or at the rate of 40 pounds per acre on one set of plots; and 8 pounds per plot, or at the rate of 80 pounds per acre on the other set. The former representing the thin sowing of flax as grown for seed, the latter the thick sowing where it is grown for fibre.

One-half of each plot was pulled when about one-third of the seed was ripe, for fibre; this was tied up in sheaves and cured. 50 pounds out of each plot was put up in bundles, making in all 400 pounds, which was shipped to J. & J. Livingston, Baden, Ontario, to be tested as to the yield and quality of the fibre.

The other half of each plot was harvested in the usual manner after the seed was ripe. The following results were obtained :—

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		Lbs.	Bush.	lbs.	Lbs
No. 1—									
Thick sowing	May 14.	Aug. 6.	84	28	Fine ...	4000	20		54
Thin "	" 14.	" 6.	84	28	Stiff	3400	20		54
No. 2—									
Thick "	" 21.	" 13	85	28	Fine ...	3400	20		55
Thin "	" 21.	" 14.	85	28	Stiff	5000	32	40	55
No. 3—									
Thick "	" 28.	" 21.	85	26	Fine ...	5800	24	40	53
Thin "	" 28.	" 21.	85	26	Stiff	6000	26	20	54
No. 4—									
Thick "	June 4..	" 28.	85	26	Fine ...	8200	34	20	55
Thin "	" 4..	" 28.	85	26	Stiff	4200	24		54

GENERAL STATEMENT OF CROP.

Eight acres of underdrained marsh gave a yield of 61 bushels of oats per acre; 4 acres of surface drained marsh yielded 43 bushels per acre; $1\frac{1}{2}$ acres of upland yielded 59 bushels of oats per acre; 2 acres of pease, 30 bushels per acre; 5 acres of buckwheat, 20 bushels per acre; this, with the total yield of all the grain plots, 702 bushels and 140 bushels from miscellaneous plots, makes a total of 1,749 bushels of grain grown on the farm during the past summer.

In addition to the root plots of 554 bushels, 1,200 bushels of mangels, 400 bushels of carrots and 3,750 bushels of turnips were grown, making a total yield of 5,904 bushels of roots.

One acre of horse beans gave a yield of 13 tons 375 pounds; $\frac{3}{4}$ of an acre of sunflowers, 2 tons 1,040 pounds; 3 acres of corn, 13 tons 730 pounds per acre, making a total of 55 tons 1,605 pounds. The silo would only hold about 48 tons of this mixture, the balance was fed to the stock.

DISTRIBUTION OF SEED GRAIN AND POTATOES.

In all 264 applicants were supplied during the past season with samples of potatoes, oats, wheat, rye, pease and barley.

Total number of packages sent out 465, as follows :—

Potatoes	155
Oats	133
Barley	67
Wheat	51
Pease	53
Rye	6

MEETINGS ATTENDED.

I have addressed meetings, during the past summer, at the following places: Durham, Pictou Co., N.S., 11th June; Georgetown, P.E.I., 30th September.

EXHIBITIONS ATTENDED.

An exhibit of farm products was made at the International Exhibition at St. John, N.B. The Westmoreland County Exhibition, Sackville, N.B., and King's County Exhibition, Georgetown, P.E.I., were attended in person during the past season.

I have the honour to be,
Your obedient servant,

GEO. W. FORREST,
Superintendent.

REPORT OF THE HORTICULTURIST.

(W. S. BLAIR.)

To DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith a report of some of the work done in the Horticultural Division of the Experimental Farm for the Maritime Provinces for the year 1896.

The work carried on in this department has been similar to that of former years; the orchard each year requires more attention; the addition in duplicate of 125 different varieties of ornamental trees and shrubs, together with an addition to the lawn area, makes the work of this department much greater than formerly.

The experiments with garden produce for market purposes were continued in small plots; from these experiments much valuable information was obtained.

With the exception of the addition of 25 varieties of strawberries sent from the Central Experimental Farm, no extension was made to the small fruit plots. The exhibit at the International Exhibition, St. John, N.B., of 40 of the different varieties of small fruits grown here, and which were shown in glass jars done up in liquid preservatives, assisted in making the farm exhibit attractive and instructive.

Through the kindness of Mr. Samuel Harrison, Maccan, N.S, a series of experiments in spraying were conducted by myself in his orchard. This orchard of some 23 varieties of apples, nearly all of which are old trees of standard sorts, permits of more valuable and extensive experiments than any that could be conducted in the young orchard now growing on the farm. From these experiments sufficient data was not obtained for publication; yet the information gathered will add greatly to the value of future experiments along this line here.

It was particularly noticed that the fruit of the trees which were sprayed was more or less russeted, while those not sprayed and left as check trees were free from it. The solution of Bordeaux mixture used was prepared according to the standard formula and Ferrocyanide test. The orchard on the farm was sprayed with a mixture of the same strength, and it was almost impossible to get fruit that was not more or less russeted, while in an adjoining orchard fruit of some of the same varieties was entirely free.

Data on the blossoming period of the different varieties of fruit grown on the farm was furnished the horticulturist of the Central Experimental Farm.

GRASSES.

Seed was collected from the twenty different varieties of grasses reported as grown on this farm last year.

Larger grass plots were sown on the 27th of April of 13 of the most desirable varieties. It is hoped that by this means information on the comparative value of these different grasses may be obtained. We are indebted to Mr. J. Parsons of the Marine and Fisheries Department, Halifax, for a sample of Tussock grass from the Falkland Islands. This was carefully sown and has so far made excellent growth. Two plots of crimson clover were sown this fall, one on the 18th of August, the other on 1st September, these made good growth, and the effect of the winter on them will be watched with interest.

FLOWERS

The flower garden of 91 varieties of annual and 36 varieties of perennial flowering plants made a very attractive show during the summer months.

The list given in the report from this farm for 1894, page 278, of varieties grown here together with other new varieties which have been added from time to time contribute to make up an interesting collection.

The 45 varieties of Sweet Pease were perhaps the most attractive of all the flowering plants grown during the past summer. They are a universal favourite; their continuous bloom and easy culture, would alone recommend them. Forty varieties of Dahlias received from the Central Experimental Farm added greatly to the beautifying of the farm grounds. In addition to the Bulbs referred to in a previous report of this farm, and which have annually given a profusion of bloom, 32 varieties of Tulips; 7 of Crocuses; 10 of Iris Anglica; 3 of Hyacinths; 6 of Narcissus and 1 of Iris Hispanica were received from the Central Farm, and planted this fall. In the beautifying of our rural homes by the addition of flowers we find ample scope for improvement. The show produced by the different varieties of flowers grown here has a far reaching influence; acting as an object lesson, it stimulates a greater interest in the culture of flowers amongst the many people who annually visit the farm.

ORNAMENTAL TREES AND SHRUBS.

To the list of ornamental trees and shrubs reported on as hardy in the report of this farm for 1894, page 272, can be added those which were planted out in the fall of 1895 and which have so far stood the climate here. They are as follows:

Acer, p. Schwedleri.
" Pseudo-platanus.
" Reitenbachii.
" Pseudo-platanus Woorlei.
" monspessulanum.
Alnus laciniata imperialis.
" cordata.
" incana laciniata.
Artemisia Abrotanum.
Berberis Darwinii.
Cratægus torminalis.
Cornus sibirica variegata.
Corylus purpurea.
Cupressus Lawsoniana.
Deutzia Wellsii.
" gracilis variegata.
Diospyros Lotus.
Diervilla (weigelia) candida.
" " Sieboldii.
" " Stelzneri.
" " Abel Carriere.
" " amabilis.
" " Variegata nana.
Elæagnus argentea.
Fraxinus americana.
" Ornus.
Forsythia viridissima variegata.
Filaria Latifolia.
Gleditschia triacanthos.
Indigofera dosua.
Juniperus Sabina.
" communis.
" c. suecica.
Jasminum frutescens.
" nudiflorum.
Kolreuteria paniculata.
Berberis ilicifolia.
Betula purpurea.
" alba pyramidalis.
Bocconia cordata.
Cytisus hirsutus.
" trifolius.
" triflorus.
Caragana pygmaea.
Celtis audibertii.

Ptelea trifoliata.
Potentilla fruticosa.
Philadelphus inodorus.
Paulownia imperialis.
Quercus coccinea.
Rhamnus catharticus.
Retinospora pisifera.
Rhus Cotinus.
" coriaria.
Spiræa japonica alba.
" callosa alba.
" " rosea.
" Douglasii.
" ulmifolia.
" Bumalda.
" Billardi alba.
" ariæfolia.
" Billardi rosea.
" callosa superba.
" " macrophylla.
Sophora japonica.
Sorbus domestica.
Sambucus pyramidalis.
" aurea.
" laciniata.
" pulverulenta alba.

Ligustrum japonicum.
" Ibota
" ovalifolium variegata.
Lonicera Alberti.
Liriodendron tulipifera.
Mahonia Aquifolium.
Prunus Simoni.
" sinensis rosea.
" triloba.
" Pissardi.
Ptelea trifoliata aurea.
Sambucus variegata aurea.
" " argentea.
Thuya occidentalis compacta.
" " variegata.
" " Hoveyi.
" " lutea.
" " Elwangeriana.
" " vervæneana.
" ericoides.
Zanthoriza sorbifolia.

HEDGES.

The twenty-one different varieties of trees and shrubs which were planted as hedges in the fall of 1895, have with few exceptions made excellent growth. The names of those planted are :—

Picea pungens, Rocky mountain blue spruce. Spiraea opulifolia aurea. Golden-leaved spiræa. Ligustrum amurense, Amur privet. Pseudotsuga Douglasii, Douglas spruce. Berberis Thunbergii, Thunberg's barberry. Pinus Cembra, Swiss stone pine. Spiræa opulifolia aurea, Golden leaved spiræa. Picea excelsa, Norway spruce. Acer Ginnala, Ginnalian maple. Rosa rubrifolia, Red-leaved rose. Syringa vulgaris, Seedling lilac. Cotoneaster acutifolia, Sharp-leaved cotoneaster. Spiræa Van Houttei, Van Houtté's spiræa. Lonicera chrysantha, Bush honeysuckle. Rhamnus Frangula, Breaking Buckthorn. Acer glabrum, Smooth maple. Cotoneaster vulgaris, Common cotoneaster. Caragana frutescens, Woody caragana. Viburnum Lantana, Pliant viburnum. Caragana arborescens, Siberian Pea-tree. Berberis vulgaris purpurca, Purple leaved barberry.

PEASE.

Twenty of the many varieties of garden pease advertised in the different seed catalogues were experimented with this year. These were sown on May 11th. The Steele Briggs Co's., Extra Early, Maud S. and Sunol were the earliest varieties, being fit to market July 12th ; Ringleader, First of All, and little Giant on the 17th of July ; Pride of the Market, Bliss' American Wonder, Telegraph, and Stratagem on July 25th. Maud S. is the most productive of the early varieties recommended. Ringleader was the most productive of the second earliest varieties ; and the Pride of the Market and Telegraph on account of their productiveness can be recommended as the most desirable of the later ripening sorts.

RADISHES.

Fourteen varieties of radishes were sown on May 11th. The Radish Maggot again made its appearance about the time the crop was fit for market, and completely destroyed it. The varieties:—New Rosy Gem, French Breakfast, Non Plus Ultra and Olive Rose were the finest of the early varieties, these were fit to use on June 13th. The White Tipped Scarlet, Dark Scarlet and Oval Scarlet Red, maturing a week later, makes up an excellent combination of fine market varieties.

BEETS.

Ten varieties of beets were under test. The seed was sown on May 9th. The Egyptian Turnip was fit to market on July 22nd. Extra Early Eclipse, Crosby's Improved and Edmund's Early were fit a few days later. Deware's Half Long, Improved Dark Red and Black Queen were in a marketable condition on August 6th. Dell's Dark Blood is an excellent later variety.

EARLY TURNIPS.

Six varieties of turnips for early market were tested. The seed was sown on May 9th, the first marketable ones were pulled on July 22nd. Of these varieties the White Egg, Orange Jelly and White Model ranked first.

CARROTS.

Nine varieties of the early market sorts were experimented with. The seed of these was sown on May 9th. The first were fit for market on August 2nd. The most desirable and earliest varieties are: Early Scarlet Horn, Scarlet Model and Guerande. The Peer of All, about one week later, is an excellent variety.

SQUASHES.

Seven varieties of squashes were sown in the open ground on May 11th. The following notes were taken:—

Summer Crookneck.—Ready for use August 6th, quality fair; quite productive.

Essex Hybrid.—Fit to use August 15th, quality best; prolific. The best autumn variety.

Long White Bush.—Fit to use August 16th, quality fair; prolific.

Boston Marrow.—Fit to use August 29th, quality excellent; quite prolific.

Cocozella.—Fit to use September 4th, quality good; of bush habit.

Fordhook's.—Fit for use September 9th, quality good; not productive.

Hubbard.—Fit for use September 9th, one of the most valuable; an excellent winter variety, very prolific.

CABBAGE.

Twenty-eight varieties of cabbage were sown in the hot bed on April 14th. These were transplanted to the open ground on June 2nd. Kerosene emulsion, as well as other preventives recommended for the killing of the cabbage root maggot, were applied on June 8th; again on the 10th and one week later. None of the preparations used seemed to be of much value; at least, none could be recommended although the kerosene emulsion was the most effective. The plants of the different plots were so killed by the root maggot that a report as to comparative yields could not be obtained.

What plants of the Extra Early Express variety survived were fit for market on August 1st. The Jersey Wakefield August 4th. See Experimental Farm report 1895, page 273.

CAULIFLOWER.

Thirteen varieties of cauliflower were sown on April 14. These were transplanted from the hot bed to the open ground, June 2nd. With few exceptions these were all killed by the root maggot.

ASPARAGUS.

Of the three varieties of asparagus planted, in May, 1894, the Columbian Mammoth White is the most desirable one. It is vigorous in habit and throws up many large white shoots. Following it comes the Barr's Mammoth and Giant Early Argenteuil, both excellent varieties.

GARDEN CORN.

Ten varieties of corn for early market were sown on May 11th. The Early White Cory was fit for use August 22nd. The Early Marblehead and Mitchell's Extra Early on August 24th. These, without a doubt, are the three best early varieties that we have ever had under test here.

CUCUMBERS.

Of the different varieties of cucumbers tested here, the Siberian ranks first in point of earliness, some of which were fit for market July 31st. The White Spine and Cool and Crisp come next as favourites for general use. The new Paris Pickling is one of the finest pickling sorts tested here. The seed of the different varieties was sown on May 11th.

TOMATOES.

Twenty-four varieties of tomatoes were sown in boxes on April 2nd, and transplanted to 4 inches apart in the hot bed April 21st. These were set in the open ground on June 10th and made excellent growth.

The first to ripen were: Earliest of All and Imperial on August 20th, Mayflower, Leader and Fordhook's First on August 24th, Early Ruby and Atlantic Prize on August 30th, Conqueror and Livingston's Beauty September 3rd. The varieties Earliest of All and Imperial, although the earliest ripening and quite prolific, are inclined to be small; and crack badly. The Early Ruby, Atlantic Prize, Fordhook's First and Leader took first place amongst all varieties tested during the past season, and rank in the order named as the best market sorts.

STRAWBERRIES.

In addition to the eighteen varieties of strawberries set out last season and named in the last annual report of this farm, twenty-five new varieties were received from the Central Experimental Farm, making a total of 43 varieties now growing here. The varieties added are: Robinson, B.; Bisel, P.; and Range County, P.; Brandywine, B.; Ostego, P.; Tennessee Prolific, B.; Wm. Belt, B.; Rio, B.; H. W. Beecher, B.; Greenville, P.; Gen. Putman, B.; Swindle, B.; Chairs, B.; Enhance, B.; Gem. P.; Equinox, B.; Clark's Early, B.; Paris King, B.; Charlie, B.; Hope, B.; Dew, B.; Mincola, P.; Caughall Seedling, P.; Thompson's Late, P.; Smith's Seedling, B.

The varieties planted out last season only set a fair amount of fruit. The land devoted to these plots is rather uneven in texture and quality for a fair comparative test. It is proposed to extend the plots to a more suitable soil.

Of the varieties which fruited during the past summer the following were the most prolific in the order named: John Little, Crescent, Warfield and Beverly. The first fruit was picked July 5th.

ENGLISH GOOSEBERRIES.

The varieties, as named in the last annual report of this farm, were again under test. In the maritime provinces conditions seem to be very favourable for the growth of this valuable fruit. The possibilities of export through the cold storage medium are very encouraging to the grower of this small fruit.

Three out of the varieties which colour their fruit when ripe were selected on account of their vigorous growth and productiveness as the most promising. They are in the order named:—1st, Industry; 2nd, Red Champagne; 3rd, Crown Bob.

Of the green coloured varieties:—1st, Leveller; 2nd, Queen Victoria; 3rd, White Champagne. These ripened their fruit from the 9th to the 12th of August.

The Whitesmith and Lancashire Lad are both very vigorous growers, but have not as yet been very productive here. They ripen their fruit about the 10th of August. Early Sulphur is of excellent quality, and was ripe the 4th of August, followed by Dublin, a variety with a larger berry, which ripened the 7th of August, these are two excellent early varieties.

RASPBERRIES.

The varieties Heebner, Cuthbert, Hudson River Antwerp, Caroline, Hansell, Niagara, Clarke, Golden Queen, Reeder, Marlboro' and Hornet, were the most productive in the order named. The Antwerp, like the Cuthbert, has a firm, large berry, but is not

as productive. The Heebner, although more prolific than the Cuthbert, is not as firm, and is not so desirable a fruit, either for shipment or home use. The Caroline is not firm enough in the fruit for a market berry. The Golden Queen can be recommended as much the most desirable yellow variety tested here.

BLACK RASPBERRIES.

The four varieties of black raspberries set out last year made good strong growth. The varieties Progress and Older were the most prolific, the latter being the most desirable fruit.

BLACKBERRIES.

Of the blackberries planted last year, the Eldorado and Stone's Hardy made poor growth during the summer of 1895, and wintered poorly. The Snyder, which has been grown here for several years, although a vigorous grower, is not, with us, a productive variety. The Agawam and Ancient Briton both ripened fruit about the same time, the latter being a few days the earliest. The Agawam was much more prolific than the Ancient Briton, this placing it first as a profitable variety.

GRAPES.

The Green Mountain grape, now six years from the nursery, from its vigorous growth, hardiness, and the early ripening of its fruit, promises to be a valuable grape for these provinces. The eight varieties planted last year have, with few exceptions, made very good growth, and came through the winter in good condition:—

Name of Variety.	Number of Vines Planted.	Number of Vines Which Wintered.
Lady	2	1
Rogers 17	2	2
Vergennes	2	1
Moore's Diamond	2	2
F. B. Hayes	3	3
Barry	3	1
Florence	3	1
Herbert	3	3

APPLES.

The apple orchard of 267 trees made up of 97 different varieties of apples and 9 varieties of crab apples, have, with few exceptions, made good growth during the past season. In the nursery are 47 varieties which are ready to be set out next spring.

Forty-two varieties fruited this year, some of which bore well. The following varieties in the order given were the most prolific of the summer apples. Yellow Transparent, Anis, White Astrachan and Red Astrachan. Of the autumn sorts: Duchess, Borovinka, Titovka, Benoni and Ostrakoff, fall and early winter: Longfield, Aport, Alexander, Scott's winter, Haas and Pewaukee; of winter sorts, Ben Davis and Golden Russet.

Fruit from the varieties which fruited was shown at the St. John exhibition, making a very attractive display.

PEARS.

No addition was made to the pear orchard during the past year. This orchard of 58 trees includes 27 varieties. Nine varieties set in nursery rows in the spring of 1895, will be planted in their permanent places next spring. The pear trees have made a strong, vigorous growth, the wood ripening up well. Many of the varieties blossomed in the spring but failed to set fruit, except on a tree each of Tyson and Bartlett. The Flemish Beauty, Tyson, Clairgeau and Clapp's Favourite are exceptionally thrifty growers.

CHERRIES.

The cherry orchard of 37 varieties, embracing 80 trees, made good, strong growth, many of the varieties fruited well. The Gov. Wood and Coe's Transparent, both belonging to the Heart cherries, are excellent yellow varieties. They are both hardy and productive, fruit firm and of excellent quality. Ripened July 20th. The Dyehouse, a dark red variety, is very prolific, a sure bearer and a few days earlier than the Early Richmond. The Early Richmond, fruit of which ripened July 26th, is a very strong grower, but it is not very productive here, producing only a limited amount of fruit so far. The Montmorency is a very productive variety, ripening after the Early Richmond. The English Morello is a very fine sort, but is one of the latest to ripen. It should be particularly useful as a late market sort.

PLUMS.

The plum orchard of 35 different varieties, making a total of 93 trees, made a strong growth during the past season. Fruit did not set well on any of the varieties except the Moore's Arctic which, on account of its hardiness and its being a prolific bearer, we would place first as one of the most desirable varieties so far tested here.

The Lombard is also a very strong grower and quite prolific, producing this season a fair amount of fruit. Imperial Gage and Shipper's Pride also bore some fruit.

NUTS.

Seven varieties of nuts were set in the spring of 1895. The Japanese Chestnuts were winter killed. One of the two trees set of the American Chestnut failed to grow, the other made good strong growth. The Black Walnuts set all made strong growth. The Japan Walnut, Juglans Sieboldii ; has made strong growth. The Max Cordiformis has made fair growth. The filberts tested Cosford Cob and Kentish Cob have not made much growth during the past season, they kill back badly during winter.

I have the honour to be,
Your obedient servant,

W. S. BLAIR,
Horticulturist.

EXPERIMENTAL FARM FOR MANITOBA

BRANDON, MAN., 30th November, 1896.

To Dr. WILLIAM SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my ninth annual report, with details of the experiments undertaken and work accomplished on the Brandon Experimental Farm, during the past year.

It is customary here to say that the seasons are all exceptional, but in my nineteen years' experience in the province, I have known no season that may be compared with the past one. While the temperature of April was one degree above the mean average for the month, the excessive rainfall so delayed seeding that not one per cent of wheat sowing was done at the close of that month; while, as a rule, 90 per cent is finished by that date.

The temperature for May was even higher than that of April, being from three to six degrees above the mean average, and the rainfall from two to three times above the average. This high temperature, accompanied with abundant moisture, produced a rank, weak growth, followed by rust on the leaves of grain. On the 27th of June, lodging commenced, and in a few days rust attacked the stalks of oats and wheat, and soon spread all over the plants, many fields being badly affected. The amount of injury from this cause varied according to the locality and the variety of grain, the rank growing sorts on the richer lands suffering the most.

The temperature and rainfall of July, August and September was about the average, but in spite of this the ravages of rust continued, and were shown in delayed ripening, rusty, weak straw, shrunken heads, reduced yield, and a light-weighted sample.

In spite of rust, many varieties of grain have given excellent yields, but in nearly all cases the weights per bushel are below the average.

It will be noticed that hay, fodder, root crops, fruits and vegetables have all given yields much above the average, and forest trees have made more growth than in any previous year.

I desire to call special attention to that portion of my report devoted to Awnless Brome grass, as this is evidently a suitable grass to take the place of our rapidly disappearing native meadows; and this subject is of increasing importance to the central and western portions of the province.

From the results of the experiments with smut preventives, described in this report, it will be seen that they corroborate those made in former years, and that this disease can be controlled, and large sums of money thus saved to the farmers of this province.

I would also call attention to the comparative productiveness of Banner oats over other varieties as shown in this year's experiments, and in the table covering the work of several years.

EXPERIMENTS WITH WHEAT.

Owing to the very wet and late spring the test plots of wheat could not be sown until the 8th May, nearly a month later than the average date. The ground was scarcely dry when the grain was sown and above the average amount of rain fell during the remainder of the month, encouraging a soft growth which showed signs of rust on the leaf by the end of May, and before the plants were a foot high.

The warm moist weather of the middle of June appeared to encourage the rust, until it spread from leaf to stalk and from stalk to head, many of the fields turning to a rusty yellow colour, seldom or never seen here before; its effects were soon seen in a

weakening of the straw, delayed ripening, and partially filled head and a shrunken berry. The injury was not so apparent on sandy or gravelly land, still on this class of soil the grain did not give the return expected. Lodged grain was injured to a much greater extent than that which stood up well.

The effects of rust are shown very clearly in the weight per bushel, of the grain none of the varieties exceeding 60 pounds per bushel and most of them being under that weight.

Wheat sown on backsetting was quite free of rust, even in the lower parts of the valley, the straw there being bright but not rank and the heads fairly well filled with grain, which weighed from 60 to 62 pounds per bushel.

A feature of the season has been the almost entire absence of smut in wheat, the smutty sample sown giving no more smutty heads than the cleanest seeds.

This year forty varieties of wheat were grown in one-tenth acre plots side by side.

Rust has this season somewhat changed the relative positions of the different varieties as to yield, Red Fife being lower on the list than usual, while Rio Grande, Goose and Monarch gave larger comparative yields, White Fife, Pringle's Champlain and Old Red River are in about their usual positions in this respect.

All were sown on 8th May with a hoe drill, soil rich loam, summer fallowed.

WHEAT—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per bushel.	Proportion Rusted.
			In.		In.		Lbs.	Bus.	lbs.	Lbs	
Rio Grande	Aug. 25	109	39	Weak	5	Bearded	3,740	38	30	60	Some.
Goose	Sept. 11	126	44	Very weak	3	"	5,040	38	30	59	Badly.
Monarch	" 1	116	43	Fair	4	Beardless.	4,200	32	30	58	Some.
Hungarian	" 4	119	40	"	4	Bearded	3,450	30	50	60	Badly.
Pringle's Champlain	Aug. 25	109	45	Weak	4½	"	4,040	29	20	58	"
White Fife	Sept. 4	119	40	Fair	3½	Beardless.	3,700	29	10	58	Little.
Old Red River	" 3	118	43	Stiff	4	"	3,960	28	10	60	Badly.
Huron	Aug. 25	109	43	Fair	3½	Bearded	3,310	28	10	57½	"
Advance	" 25	109	45	Weak	3	"	4,260	28	10	58	"
Colorado	" 25	109	45	Very weak	2½	"	2,880	27	50	59	Little.
Crown	" 25	109	44	Weak	3½	"	3,590	27	40	58	Badly.
Velvet Chaff	Sept. 4	119	43	Stiff	3½	Beardless.	3,890	27	40	58	"
White Russian	Aug. 24	108	41	Fair	4	"	3,450	26	40	58	Some.
Red Fife	Sept. 4	119	43	"	3	"	4,200	26	40	59	Little.
Herisson Bearded	Aug. 24	108	37	Very weak	2	Bearded	3,610	26	30	59	Badly.
Wellman's Fife	Sept. 1	116	43	Stiff	3½	Beardless.	4,480	26	10	60	"
Beauty	" 4	119	43	"	5	"	3,750	25	50	58	"
Countess	Aug. 25	109	41	Fair	2½	"	3,180	25	20	60	"
Vernon	" 24	108	38	Very weak	3	Bearded	3,640	25	10	56½	"
White Connell	Sept. 1	116	42	Fair	4	Beardless.	3,850	25	..	59	"
Stanley	Aug. 25	109	47	Weak	3	"	4,850	25	..	58	"
Captor	" 25	109	45	Fair	4	"	3,800	25	..	58	"
Dufferin	" 25	109	47	Stiff	4	Bearded	2,930	24	30	58	"
Emporium	" 28	112	44	"	3½	"	3,580	24	30	59	"
Alpha	" 28	112	48	Fair	4	Beardless.	3,380	24	30	58	"
Red Fern	Sept. 3	118	47	Stiff	4	Bearded	3,040	24	20	59	Slightly.
Gehun	Aug. 25	109	41	Varies	3	Beardless.	2,900	24	10	57½	Badly.
Dawn	" 19	103	47	Fair	3¾	"	2,800	24	10	60	Slightly
Dion's	Sept. 4	119	43	"	4	Bearded	2,910	24	..	58	Badly.
Blenheim	Aug. 25	109	42	Very weak	4	"	4,030	23	40	58	Slightly.
Campbell's White Chaff	" 28	112	42	Rank	3¾	Beardless.	3,640	23	30	58	Badly.
Progress	" 25	109	40	Fair	3½	"	3,500	22	30	58	"
Admiral	" 23	107	46	Weak	3½	"	3,550	22	30	58	"
Rideau, White Chaff	" 25	109	47	"	4	"	2,800	21	40	55	"
Percy	Sept. 1	116	43	"	3½	"	3,610	20	40	56	"
Beaudry	Aug. 24	108	47	"	3½	Bearded	3,640	19	20	55	"
Ladoga	" 25	109	41	Fair	3	"	3,220	18	50	56	"
Rideau, Red Chaff	" 25	109	45	"	3	Beardless.	2,380	18	40	54	"
Golden Drop	" 25	109	37	Very weak	3	"	3,140	18	30	57	"
Black Sea	" 20	104	44	Weak	3	Bearded	2,840	18	30	55	Some.

AVERAGE RESULTS FROM FOUR YEARS TESTS WITH VARIETIES OF WHEATS.

The appended table shows the average return from several of the leading varieties of wheat for the past three or four years.

Goose wheat takes the lead in yield but is deficient in quality and matures late.

Preston a cross-bred variety comes next in yield and is on an average four days earlier than Red Fife. I regret very much that I am unable to give the returns of this variety for 1896.

Red and White Fife yield within eight pounds of each other, take the same time to mature and stand fourth and fifth respectively for productiveness.

Name of Variety.	Years Included.	Average Yield per Acre.		Average Days Maturing.
		Bush.	lbs.	
Goose	1893 95-96	38	56	124
Preston	1893-94-95	36		113
Rio Grande	1893-94-95-96	35	45	112
Red Fife	1893-94-95-96	33	45	117
White Fife	1893-94-95-96	33	37	117
Pringle's Champlain	1893-94 95-96	33	25	113
Herisson Bearded	1893-94-95-96	32	27	114
Old Red River	1893-94-95-96	31	12	116
White Connell	1893-94 95-96	30	25	116
Red Fern	1893-94-95-96	30	15	114
Stanley	1893 94-95-96	30	10	112
Hungarian	1893-94-95-96	30		117
Crown	1893-94-95-96	29	20	113
White Russian	1893-94-95-96	29	2	116
Wellman's Fife	1893-94-95 96	28	17	117
Campbell's White Chaff	1893-94-95-96	27	35	113
Colorado	1893-94-95-96	27		109
Ladoga	1893-94-95-96	26	52	110

CROPS ON NEWLY BROKEN LAND.

During 1895, twenty acres of meadow land was broken up and back-set; a part of this was broken during April and May, and the balance late in June; neither the early April or late June breaking was satisfactory, the wild sunflowers not being effectually killed, when the breaking was done at these dates. The land broken in May was quite free of sunflowers and produced much the largest crop of wheat.

This twenty acres is all dark brown alluvial soil and is quite distinct from that of any other portion of the farm; and possesses special interest for the reason that there are large areas of similar land in the province. This field was all sown to wheat this year, the crop was not a heavy one, but was freer from rust than other parts of the farm.

The following table gives particulars of the yield of different varieties of wheat grown on this land, but the breaking having been done at different dates, conditions were not uniform and the yields must not be taken as a fair comparative test of varieties.

FIELD PLOTS OF WHEAT ON NEWLY BROKEN LAND.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Character of Straw.	Kind of Head.	Yield per acre.		Weight per Bushel.
							Bush.	Lbs.	Lbs.
Red Fife	4 acres.	May 6	Aug. 19	105	Stiff	Beardless	24		61½
Crown	2 "	" 6	" 16	102	"	Bearded	23	50	60½
White Connell	3 "	" 6	" 18	104	"	Beardless	23	20	61
Alpha	1 "	" 6	" 16	102	"	"	22	55	61
Percy	2 "	" 6	" 17	103	"	"	20	30	61½
Preston	5 "	" 6	" 12	98	"	Bearded	18	45	62

THE PREPARATION OF LAND FOR THE SECOND CROP OF WHEAT AFTER A CLEAN SUMMER FALLOW.

During the years 1894 and 1895 experiments were conducted here in sowing wheat on spring-ploughed land as against sowing on the unploughed stubble.

In both these years and on different portions of the farm the largest returns were obtained from unploughed land, this year the results were reversed, the ploughed land giving the best yield, this is no doubt attributable to the different conditions of moisture prevailing this year.

The rainfall of 1894 and 1895 was somewhat below the average, and under these conditions the unploughed soil retained moisture which was an advantage, but the rainfall of the past season has been excessive, and the unploughed land became saturated with water and the growth of the grain was retarded and that of weeds encouraged. The plots were $\frac{1}{10}$ acre each, and the soil was a rich clay loam, almost level, but not wet.

The summer fallow was ploughed deeply in June and cultivated on the surface during the summer to keep down weeds. The unploughed stubble plot was summer-fallowed in 1894, was quite free of weeds, and received no preparatory treatment, the seed being simply press-drilled as deeply as possible with a Superior machine, all were sown on May 29th.

Variety.	How prepared.	Rust.	Ripe.	Length of Straw.	Length of Head.	Yield per acre.		Weight per bushel.
				Inches.	Inches.	Bush.	Lbs.	Lbs.
Red Fife	Summer fallowed	Very bad	Sept. 12	39	3½	26	40	55
"	Spring ploughed	Bad	" 7	34	3	21	40	54
"	Stubble unploughed	"	" 6	36	3	17	30	57

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

This series of experiments has been continued during the past season, but owing to the very late spring it was not thought advisable to sow more than four plots, and the result showed the wisdom of that conclusion, the last sown plots of all but Odessa Barley being very badly frozen, and any plots sown later would not have ripened.

The sudden drop from 105 to 44 bushels in the last two plots of Banner and the same proportionate difference between the Abundance Oat is accounted for by a severe frost which occurred on 3rd September.

The very great difference between the early and late sown plots of pease seems to explain why so many farmers in this province have failed with that grain, as most of them wait until they have finished other grain before sowing pease, this practice is very likely to result in a small yield and a poor sample.

All these plots were sown on summer-fallow, with a hoe drill. Soil, a clay loam uniform in character, size of plots $\frac{1}{10}$ acre.

WHEAT—Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.		Date of Ripening.		Number of days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per bush.	Rusted.
						In.	In.		Lbs.	Bush.	Lbs.	Lbs	
Red Fife.......	May	8	Sept.	3	118	42	$3\frac{1}{2}$	Beardless...	3,490	27	40	60	Considerably.
"	"	15	"	8	116	43	$3\frac{1}{4}$	" ...	4,550	28	20	59	"
"	"	23	"	11	111	43	3	" ...	3,570	28	50	58	"
"	"	30	"	15	108	43	3	" ...	3,990	21	..	50	"
Stanley........	"	8	Aug.	25	109	41	$3\frac{1}{2}$	" ...	4,020	27	10	58	Slightly.
"	"	15	Sept.	3	111	41	3	" ...	3,990	28	30	59	"
"	"	23	do	8	108	41	$3\frac{1}{2}$	" ...	3,480	27	..	58	"
"	"	30	do	11	104	43	$3\frac{1}{2}$	" ...	3,260	26	30	$57\frac{1}{2}$	"

OATS.—Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.		Date of Ripening.		No. of days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
						In.	In.		Lbs.	Bus.	Lbs.	Lbs	
Banner............	May	8	Aug.	29	113	33	8	Branching..	3,420	67	2	37	Badly.
"	"	15	Sept.	3	111	47	8	"	4,230	85	30	35	"
"	"	23	"	8	108	54	10	"	4,100	105	30	35	"
"	"	30	"	11	104	52	9	"	3,500	44	4	28	"
Abundance........	"	8	Aug.	27	111	53	11	"	4,700	80	30	30	"
"	"	15	Sept.	1	109	44	9	"	4,130	85	30	34	"
"	"	23	"	8	108	41	9	"	4,000	79	14	33	"
"	"	30	"	11	104	43	8	"	2,130	27	2	27	"

BARLEY—Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening	No. of days Maturing.	Length of Straw.	Length of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				In.	In.	Lbs.	Bush.	Lbs.	Lbs.	
Odessa, (six rowed.)....	May, 8	Aug. 10	94	41	3	4,030	54	28	47	None.
"	" 15	" 15	102	41	3	5,370	56	42	47	"
"	" 23	" 17	86	36	2½	4,110	59	8	47	Little.
"	" 30	" 31	93	36	3	3,610	56	2	50	"
Canadian, Thorpe (two rowed.).............	" 8	" 25	109	34	3	4,150	44	38	51	"
"	" 15	" 31	108	40	3½	3,260	55		50	"
"	" 23	Sept. 3	103	42	3	2,980	58	36	49	"
"	" 30	" 11	104	36	4	4,210	45	13	47	"

PEASE—Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening	No. of days Maturing.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	In.		Bush.	Lbs.	Lbs
Mummy..........................	May 8	Aug. 28	112	80	2	Medium....	56	40	64
"	" 15	Sept. 1	109	72	2	"	55	40	65
"	" 23	Aug. 28	97	68	3	"	26		64
"	" 30	Sept. 12	105	84	3	"	31	40	64
Golden Vine.....................	" 8	Aug. 28	112	48	3	Small ...	37	40	62½
"	" 15	Sept. 1	109	45	3	"	34		62
"	" 23	" 4	104	46	3	"	37	40	62
"	" 30	" 12	105	41	3	"	22		58

EXPERIMENTS WITH OATS.

Sixty-four varieties of oats were grown this year ; all were sown on 14th May, on $\frac{1}{10}$th acre plots, on a fairly rich, black, sandy, loam, uniform in character and which had been summer fallowed.

Like the wheat these plots all suffered more or less from rust, but there was a greater difference in this respect between the varieties than there was with the wheat, all the rank, coarse strawed, late varieties suffered badly, both in yield and weight, among these Scotch Hopetoun, a very rank growing sort. This and the Dunn variety were almost destroyed by rust. Banner, although considerably tinted with rust gave the large yield of 100 bushels per acre, exceeding the next highest variety by nearly 12 bushels, even this large yield was exceeded by the Banner on other parts of the farm.

The Mennonite oat keeps very close to the Banner in yield, but is far inferior to that variety in appearance, the berry being long, thin and yellow.

It is quite evident that the Banner oat is by far the most promising variety for this district, this opinion is borne out by the reports received from farmers who have been supplied with seed grain, from this farm ; some of them state that the yield from the Banner was 40 bushels per acre more than from other varieties grown by them side

by side. As this oat is an excellent one for milling purposes as well as for feed, every encouragement should be given towards its more general cultivation.

In former years the prevalence of smut in some of the varieties of oats has had a very injurious effect on the yield; this year the seed of each variety was treated with Liver of Sulphur (Sulphide of Potassium) and rust was completely wiped out in the test plots, and this fungus for once has had no influence on the yield.

The mode of using this chemical is given in another part of this report.

I regret to notice an increasing inquiry for Black Tartarian oats. In the early history of the province before the introduction of the Banner and other superior varieties of oats and before there was a demand for milling and export, the Tartarian was a desirable sort, but now that we have more prolific and also better milling and export varieties, it is a mistake to grow the black oat.

OATS.—Test of Varieties.

Name of Variety.	Date of Ripening	Number of days maturing.	Length of straw.	Character of straw.	Length of head.	Kind of head.	Weight of straw per acre.	Yield per acre.		Weight per bushel.
			Ins.		Ins.		Lbs.	Bush.	Lbs.	Lbs
Banner	Aug. 26	104	52	Fair	10	Branching.	2,600	100		35
Early Golden Prolific	Sept. 1	110	53	Weak	10	do	3,890	88	18	34
Winter Grey	Aug. 8	86	42	do	9	do	2,480	87	12	38
Mennonite	do 21	99	42	Very weak	9	do	3,160	85		35
Holstein Prolific	do 18	96	44	do	10	do	3,440	82	22	37
Scottish Chief	do 29	107	45	Stiff	10	do	3,150	80	30	37½
Abundance	do 20	98	42	Very weak	8	do	3,530	80		35
American Beauty	do 26	104	45	Fair	9	do	3,280	78	18	35
Improved Ligowo	do 26	104	45	Weak	8	do	3,130	78	18	36
New Electric	do 19	97	47	Stiff	9	do	3,240	76	26	38
Golden Beauty	Sept. 3	112	50	Fair	10	do	3,640	76	26	33½
Emporium	do 2	111	45	Weak	9	Half sided.	4,390	76	26	32
Golden Giant	do 10	119	46	Fair	10	Sided	3,710	76	6	33½
White Schonen	do 1	110	43	do	10	Branching.	3,430	75	20	36½
Victoria Prize	Aug. 16	94	44	do	9	do	3,280	75	20	38½
Master	Sept. 1	110	42	do	11	do	4,800	73	18	32
Bavarian	Aug. 26	104	51	do	11	do	3,310	73	8	34
Wallis	Sept. 1	110	52	do	10	do	3,620	72	32	34
Salzers Nameless	Aug. 19	97	45	do	11	do	3,730	72	22	36½
Siberian	Sept. 10	119	55	Stiff	10	Sided	4,280	71	6	33½
Buckbee's Illinois	do 1	110	46	Fair	7	Branching.	3,500	70	20	35
Wide Awake	do 1	110	52	Stiff	9	do	2,000	70	20	34
White Russian	do 1	110	43	Fair	10	do	4,050	70	20	36
Brandon	do 4	113	45	do	10	do	4,610	70		33
Rennie's Prize	Aug. 16	94	46	Very weak	12	do	3,370	68	18	40
Bonanza	do 18	96	50	Weak	11	do	3,300	68	8	38
Challenge	do 20	98	46	Fair	10	do	3,190	67	32	38½
Russell	Sept. 1	110	58	do	13	do	4,500	67	22	32
Miller	do 1	110	64	Stiff	12	do	4,330	66	26	33½
Flying Scotchman	Aug. 18	96	47	Weak	10	do	3,980	66	26	35½
Abyssinia	Sept. 1	110	49	do	9	Sided	3,890	65		34
Imported Irish	Aug. 20	98	49	do	11	Branching.	2,820	64	4	37
Hazlett's Seizure	do 25	103	49	do	8	do	3,510	62	32	34½
Welcome	do 19	97	46	Fair	12	do	3,190	62	2	36
Cream Egyptian	Aug. 19	97	49	Stiff	10	Branching.	3,190	62	2	38
Early Archangel	do 24	102	51	Weak	9	do	3,160	61	16	37½
Poland White	do 23	101	47	Very weak	8	do	3,530	60	30	35
Rosedale	Sept. 1	110	42	Weak	9	Half sided.	4,180	60	30	34
Columbus	Aug. 27	105	45	Very weak	9	Branching.	3,330	60	30	35½
Early Blossom	do 27	105	51	Weak	8½	Half sided.	4,560	58	18	37
Prolific Black Tartarian	Sept. 1	110	44	Fair	8	Sided	4,030	57	32	31
American Triumph	do 4	113	55	Stiff	10	Branching.	4,580	57	32	35
Oderbruch	do 1	110	50	Fair	10	Sided	4,390	57	22	35
Californian Prolific Black	do 4	113	60	Weak	10	do	4,110	57	2	32½
White Monarch	do 1	110	52	Stiff	10	Branching.	5,130	56	16	33
Early Gothland	do 4	113	50	Fair	9	Half sided.	4,190	56	6	35
Oxford	do 2	111	45	do	11	Branching.	3,810	55	20	32
Coulommiers	do 11	120	45	do	10	do	5,250	54	14	32

OATS—Test of Varieties—*Continued.*

Name of Variety.	Date of ripening.		Number of days maturing.	Length of straw.	Character of straw.	Length of head.	Kind of head.	Weight of straw per acre.	Yield per acre.		Weight per bushel.
				Ins.		Ins.		Lbs.	Bush.	Lbs.	Lbs.
Joanette	do	2	111	41	Weak	9	Branching.	4,900	54	14	35
Cromwell	do	4	113	58	do	12	do	4,900	52	32	31½
Medal	do	10	119	52	Fair	10	do	4,440	50	10	33½
Early Maine	do	7	116	50	do	8	Half sided.	4,430	49	4	33½
Prize Cluster	Aug.	20	98	49	Stiff	10	Branching	3,380	47	22	33
King	do	27	105	48	do	10	do	3,600	47	2	34
Olive	Sept.	3	112	54	Fair	10	Sided	4,870	45		22
Giant Cluster	do	3	112	50	Stiff	11	do	5,030	44	24	31
Sandy	do	4	113	52	Weak	10	Branching.	5,090	44	14	30
Early Etampes	do	10	119	51	Fair	8	Sided	4,240	44	14	26
White Wonder	Aug.	8	86	51	do	11	Branching.	3,880	41	26	39
Pense	Sept.	4	113	50	Stiff	10	Sided	4,400	39	24	29
Doncaster	do	10	119	45	Fair	11	Branching.	3,980	37	12	27
Scottish Tartarian	do	10	119	50	Stiff	8	Sided	4,510	35		28
Dunn	do	10	119	53	Fair	11	Branching.	4,640	23	28	28
Scotch Hopetoun	do	4	113	53	do	10	do	4,980	16	26	25

NOTE.—Prize Cluster, Columbus and King were all injured by washing of soil.

Improved strains of Black Tartarian oats have been imported by the experimental farms from both England and Scotland and grown side by side with the Banner, and every year but one the Banner has surpassed the Tartarian both in yield and quality on this farm.

AVERAGE RESULTS OF FROM FOUR TO SIX YEARS' TESTS WITH VARIETIES OF OATS.

From the accompanying table it will be noticed that Banner oats take the lead by over eight bushels per acre, and furthermore are excellent for feed and milling purposes.

Abundance is another good variety and ripens with the Banner.

It is noticeable that the three leading varieties are all medium in weight, and in time of maturing and all have branching heads.

At this time, when many farmers are inquiring for Black Tartarian oats, it may be advisable to call attention to the difference in the yield between that variety and the Banner, viz.: 26 bushels and 26 pounds. The Black Tartarian is also nine days later in ripening, and neither grain or straw grade as high on the market as the Banner.

Variety.	Years included.	Average yields per acre.		Average days maturing.
		Bush.	Lbs.	
Banner	1892-93-94-95-96	88	20	105
Abundance	1892-93-94-95-96	80	10	105
Holstein Prolific	1892-93-94-95-96	75	4	106
Rosedale	1892-93-94-95-96	74	14	105
Victoria Prize	1892-93- 95-96	73	13	104
White Russian	1892-93-94-95-96	72	20	108
Archangel	1892-93-94-95-96	71	8	104
Golden Beauty	93-94-95-96	70	17	110
Abyssinia	1892-93-94-95-96	70	6	108
Improved Ligowo	1892-93-94-95-96	70	2	106
Early Gothland	1892-93-94-95-96	68	32	107
Siberian	1892-93-94-95-96	64	24	116
Black Tartarian	1892-93-94-95-96	61	28	114
Columbus	93-94-95-96	59	19	106
Welcome	1892-93-94-95-96	59	14	100

In connection with the testing of oats, a trial of thoroughly screened seed oats, against unscreened oats was made with the result that the selected oats gave a yield of 100 bushels per acre, while the unscreened gave a return of only 89 bushels per acre. The oat used was the Banner. It is proposed to repeat this experiment on a larger scale next year.

EXPERIMENTS WITH BARLEY.

With the object of preventing the two-rowed varieties from lodging, rather poor light soil was selected for barley, this prevented much lodging, but resulted in a rather light yield.

The reliability of this test was also somewhat marred by the washing of soil from some of the plots. This probably accounts for varieties like the Odessa and California Prolific giving unusually small returns. The plot of Trooper was also injured in this way.

For these reasons this test of barley cannot be regarded as a reliable comparision of varieties.

All were sown on summer-fallow, 8 pecks of seed was used per acre, not bluestoned, and all varieties were free of smut except Baxter's which was more or less affected.

BARLEY, SIX-ROWED—Test of Varieties. (All sown on 19th May, on rather poor sandy loam. Size of plot, $\frac{1}{10}$ acre each. There was no rust on any of these plots.)

Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Mensury	Aug. 18	91	40	Fair	3	2,600	59	18	48
Common	" 13	86	35	Weak	2	2,760	55		49½
Champion	" 17	90	43	Very weak	3	6,000	52	4	44
Nugent	" 17	90	36	Fair	2½	2,220	45	20	49
Excelsior	" 17	90	42	Very weak	3	5,280	43	46	44
Stella	" 7	80	33	Fair	2½	2,370	42	14	50
Phœnix	" 15	88	28	Weak	2	1,890	42	14	49
Royal	" 17	90	37	"	3	2,390	41	42	46
Trooper	" 16	89	29	Fair	2½	1,940	40	40	48
Vanguard	" 17	90	32	"	2½	2,500	40	30	46½
Rennie's Improved	" 15	88	33	"	2½	2,710	39	18	49½
Surprise	" 17	90	33	"	2½	2,540	38	36	51
Baxter's	" 17	90	35	Weak	2½	1,850	36	22	48
Success	" 11	84	38	Very weak	3	4,180	35	30	43
Oderbruch	" 12	85	34	Weak	2½	1,990	34	28	49
Petschora	" 17	90	34	"	3	1,690	33	26	45
Odessa	" 17	90	32	Fair	2½	1,340	32	24	47½
Summit	" 17	90	36	"	2½	3,471	29	38	50

BARLEY, TWO-ROWED—Test of Varieties.

Newton	Aug. 20	93	23	Stiff	2	2,700	47	44	50
Bolton	" 14	87	33	Weak	3	3,120	43	16	50
Danish Chevalier	" 26	99	33	Fair	4	2,220	41	12	49
French Chevalier	" 16	89	28	Weak	4	2,430	41	2	47½
Sidney	" 14	87	39	"	3½	3,190	37	34	50
Prize Prolific	" 26	99	35	Fair	4	2,140	36	32	47½
Emerson	" 16	89	39	Stiff	3	1,940	36	32	48½
Thanet	" 26	99	31	Weak	3½	2,290	35	30	49
Monk	Sept. 4	108	36	Very stiff	3	2,910	33	6	50
Rigid	Aug. 16	89	31	Weak	3	1,530	33	6	49½
Kinver Chevalier	" 26	99	27	Fair	4	2,070	32	44	47
Canadian Thorpe	" 27	100	31	Stiff	3	2,630	32	34	50
Victor	" 19	92	29	"	2½	2,040	32	24	50
Pacer	Sept. 3	107	35	"	2	1,940	30	20	50
Nepean	Aug. 26	99	33	Fair	4	2,450	30	10	49
Beaver	" 14	87	31	Weak	3	2,980	29	28	50
California Prolific	" 28	101	26	Fair	3	1,050	23	46	50

AVERAGE RESULTS FROM FOUR YEARS' TESTS WITH VARIETIES OF BARLEY.

Among the six-rowed varieties, Mensury is gaining in favour rapidly, and is more generally grown in the North-western States than any other variety. It has a vigorous habit, and the longest head of any of the six-rowed kinds. It is very productive. The only objection that may be taken to it is its very long and persistent beard.

Odessa is a shorter-headed variety, with a berry slightly tinged with purple, fairly stiff in the straw, and medium early.

The French Chevalier has been decidedly the most productive of the two-rowed varieties, and is also one of the earliest to ripen.

Name of Variety.	Years Included.	Average Yield per Acre.		Average Days Maturing.
		Bush.	lbs.	
Mensury	1893-94-95-96	54	5	89
Common	1893-94-95-96	48	40	86
Odessa	1893-94-95-96	45	35	89
French Chevalier	1893-94-95-96	45	32	93
Duckbill	1893-94-95	44	41	94
Baxter's	1893-94-95-96	42	41	86
Rennie's Improved	1893-94-95-96	41	27	85
Canadian Thorpe	1893-94-95-96	40	7	97
Petschora	1893-94-95-96	39	25	86
Oderbruch	1893-94-95-96	39	3	86
Danish Chevalier	1893-94-95-96	37	41	97
Kinver Chevalier	1893-94-95-96	37	31	96
Thanet	1893-94-95-96	37	11	97
Prize Prolific	1893-94-95-96	37	3	97

TREATING OATS AND BARLEY FOR SMUT.

It is estimated by good authorities that from 10 to 25 per cent of the oat and barley crop of 1895 was destroyed by loose smut, some fields examined by myself were found to have 75 per cent of the heads smutted. This in the aggregate represents a very heavy loss to the farmers of the province. This year, experiments have been carried on to ascertain whether anything could be done to lessen or prevent this loss.

Two chemicals were used for this purpose, viz., bluestone (sulphate of copper) and sulphide of potassium. The latter has been tried with satisfactory results in different parts of the United States, and this year is being tested at the Canadian experimental farms. All the seed oats used in the test of varieties this season were soaked for 24 hours in sulphide of potassium liquid, and very little smut was seen. It is quite evident that this remedy is efficacious, but the labour connected with its application, and the large vessels required for soaking the grain, make it difficult to carry on in this country where grain has to be rushed in so quickly in the spring. Another objection is that late in the spring—the time in which oats are generally sown—the weather is warm, and the 24 hours' soaking, unless the grain is spread out and quickly dried, causes it to sprout; and should delay in sowing occur, the grain is thus liable to spoil.

Next to soaking in the sulphide of potassium solution, the steeping for 5 minutes in bluestone liquid generally gave the best results, and this plan may be sufficient to keep the smut in check, even if it does not at once completely destroy the smut spores. It is evident that sprinkling with the solution of sulphide of potassium has very little effect.

The Prize Cluster Oats and the Baxter's Barley sown were badly affected with smut, the Banner Oats only slightly so.

Complaints having reached me that the use of bluestone had in many cases injured the germination of oats, the seed for these plots was all tested for germination after treatment, apparently none of it was injured by the liquids.

The solution of sulphide of potassium is made by dissolving 1½ pounds of the chemical in 25 gallons of water and the oats are steeped in this solution for 24 hours, stirring occasionally so that all the grain is well soaked.

The following is a description of the manner of treating large quantities of oats or barley by the bluestone method.

A quantity of liquid is prepared, composed of one pound of bluestone dissolved in two pails of water, a coal oil barrel is then three parts filled with the grain and sufficient of the liquid is poured on to just cover the grain.

This is allowed to remain for a few minutes only, then the liquid is drawn off through a ¾-inch hole at the bottom of the barrel, and the grain emptied out; by adding about three-quarters of a pailful each time, the same liquid can be used a number of times.

REMEDIES FOR SMUT IN OATS.

Soil, clay loam; size of plots, $\frac{1}{20}$ acre; sown on 22nd May; the heads on nine square feet on each plot were counted.

Variety.	Treatment.	Bad Heads.	Good Heads.	Germination.	Yield per Acre.		Weight per Bushel.
		on 9 sq. ft.	on 9 sq. ft.		Bu.	lbs.	Lbs
Prize Cluster.	Soaked for 24 hrs. in Sulphide of Potassium, 1½ lb. in 25 galls. water.	1	305	99	67	22	32
" .	Dipped 5 min. in bluestone, 1 lb. to 3 pails water..	13	403	96	70	20	32
" .	Sprinkled with bluestone, 1 lb. to 6 bush. grain....	16	381	92	67	2	33½
" .	Sprinkled with sul. pot., 1 lb. to 8 bush. grain. ...	46	297	97	62	12	31½
" .	Dipped 5 min. in sul. pot., 1 lb. to 3 pails water....	71	324	96	64	4	32
" .	Not treated........	98	288	97	56	16	35
Banner ...	Soaked for 24 hrs. in sulphide of potassium...	0	361	99	86	16	33
" .	Dipped 5 min. in bluestone, 1 lb. to 3 pails water..	1	336	90	83	18	33½
" .	Sprinkled with bluestone, 1 lb. to 6 bush. grain....	1	327	95	60	20	29
" .	Dipped 5 min. in sul. pot., 1 lb. to 3 pails water....	5	304	92	85	10	34
" .	Sprinkled with sul. pot., 1 lb. to 8 bush. grain.....	7	316	95	74	4	33
" .	Not treated........	28	391	99	75	10	33

REMEDIES FOR SMUT IN BARLEY.

Sown 22nd May; soil, clay loam; $\frac{1}{20}$ acre; after corn; the heads on nine square feet were counted.

Variety.	Treatment.	Bad Heads.	Good Heads.	Yield per Acre.		Weight per Bushel.
		on 9 sq. ft.	on 9 sq. ft.	Bu.	lbs.	Lbs
Baxter's Barley	Soaked for 24 hrs. in sulphide of potassium, 1½ lbs. in 25 galls. water.	2	387	62	44	50
" .	Sprinkled with bluestone, 1 lb. to 6 bush. grain......	4	438	61	12	48
" .	Dipped 5 min. in sul. pot., 1 lb. to 3 pails of water...	5	474	66	12	49
" .	Dipped 5 min. in bluestone, 1 lb. to 3 pails of water..	6	477	61	32	47½
" .	Sprinkled with sul. pot., 1 lb. to 8 bush. grain	16	452	61	12	48½
" .	Not treated	16	376	60	40	48

In every case, both with barley and oats, the treated seed gave the largest yield of grain, the increase varied from two to eleven bushels per acre.

RESULTS OF SOWING GRAIN WITH DRILLS AND BROADCAST MACHINES.

In 1895 a test of seeders was made in connection with the sowing of wheat. This year a similar test was made but with oats and barley.

The result was as usual in favour of sowing with the drill, with barley the yield from sowing with the hoe drill exceeding that with the broadcast machine by 22½ bushels per acre, while with oats there was an advantage of 20 bushels per acre.

Summer fallowed land was used in both cases.

Very few farmers now use the broadcast machine, its use being confined almost entirely to land too rough or wet for the use of a drill.

OATS—RESULTS OF SOWING WITH DRILLS AND BROADCAST MACHINE.

Soil, clay loam; size of plot, one-tenth acre.

Name of Variety.	How sown.	Amount sown per acre.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Length of straw.	Kind of head.	Weight of straw.	Yield per acre.		Weight per bushel.
		Pecks				Ins.		Lbs.	Bus.	lbs.	Lbs
Banner Oats.......	Hoe drill.	7	May 26...	Sept. 4..	101	50	Branching..	4,270	89	4	35
"	Press drill	6	" 26...	" 4...	101	50	" ..	4,730	81	16	33
"	Broadcast	9	" 26...	" 5...	102	50	" ..	4,450	69	4	36

BARLEY—RESULTS OF SOWING WITH DRILLS AND BROADCAST MACHINE.

Soil, clay loam; size of plot, one-tenth acre.

Name of Variety.	How sown.	Amount sown per acre.	Date of Sowing.	Date of Ripening.	Number of days maturing.	Length of straw.	Kind of head.	Weight of straw.	Yield per acre.		Weight per bushel.
		Pecks							Bus.	lbs.	
Odessa barley......	Hoe drill.	7	May 26...	Aug. 18..	84	30	Six rowed ..	3,250	59	18	50
"	Press drill	6	" 26...	" 17..	83	33	" ...	2,930	53	26	49
"	Broadcast	9	" 26...	" 20..	86	35	" ...	3,830	36	42	49

EXPERIMENTS WITH PEASE.

Pease have again given a large yield. This cereal if sown early on strong land, seldom fails to give good returns. The weight of the samples is also good, many of the varieties weighing over 65 pounds.

A noticeable feature of this year's tests is the productiveness of the cross-bred varieties originated at the Experimental Farms, the five kinds heading the list were cross-bred varieties.

Both the Macoun and Bedford pease were injured by a wind storm, hence the returns given of these two should not be used in comparing varieties.

Late sown pease produce an abundance of straw, but fail to bloom freely and are often attacked by mildew and the yield much reduced; they should be sown as early as wheat.

On this farm they have always succeeded best on stiff clay land, but care must be exercised on such soil, that the drill penetrates sufficiently deep to cover the seed; pease deposited on the surface in this country seldom take root.

All the varieties except Bedford, Multiplier, Bruce and Macoun, were sown on the 11th of May, these four were not sown until the 18th of May. The size of the plots was $\frac{1}{20}$ acre each and the soil a stiff clay loam which had been summer-fallowed. A hoe drill was used in seeding and from 2 to 2½ bushels of seed sown per acre.

PEASE—Test of Varieties.

Name of Variety.	Date of ripening.	Number of days maturing.	Character of growth.	Length of straw.	Length of pod.	Size of pea.	Yield per acre.		Weight per bushel.
				Inches.	Inches.		Bush	Lbs.	Lbs.
Carleton	Aug. 30	111	Rank	60	2	Medium	62		65
Kent	" 27	108	Fair	44	2½	Large	61	40	64
Prince	" 28	109	Rank	55	3½	"	60	40	64
Mackay	" 28	109	"	60	3	"	60	40	64
Agnes	" 27	108	"	60	3½	"	59	40	65
Pride	" 16	97	Fair	53	3	"	56		64½
Mummy	" 22	103	"	64	3	Medium	55	40	65
Trilby	" 26	107	Rank	57	3	"	55	40	63
Crown	" 15	96	Fair	42	2½	Small	55		63
Potter	" 25	106	Rank	29	3	Medium	54	40	63½
Prince Albert	" 28	109	"	68	2½	Small	52	40	64
Creeper	" 22	103	Weak	47	2	"	52		64
Centennial	" 28	109	Fair	52	3	Medium	52		63½
Duke	" 27	108	"	61	3	Large	50	40	63½
Paragon	" 31	112	"	50	3	Medium	50	40	63
Daniel O'Rourke	" 17	98	"	48	2½	"	50	20	65
Canadian Beauty	" 26	107	Rank	36	3	"	47		63½
Blackeyed Marrowfat	" 31	112	Fair	68	3	Large	46	40	64
White "	" 31	112	"	63	3	"	44		62
Arthur	Sept. 4	109	Rank	52	3	Medium	42		62
Bedford	Aug. 29	110	Even, good	70	3	"	41	40	61¼
Yellow for Split	" 28	109	Rank	42	3	"	41	20	65
Multiplier	Sept. 30	135	Fair	63	3	Small	36	20	63
Bruce	" 6	111	Rank	67	3½	Large	25	20	62
Macoun	" 15	120	"	56	3	"	17		62½

The parentage of the cross-bred varieties of pease referred to in the table is as follows:—

Paragon.—Black-eyed Marrowfat, female, with Mummy, male.
Prince.—Mummy, female, with Black-eyed Marrowfat, male.
Macoun.— " Large White "
Arthur.— " Multiplier, male.
Bedford.— " "
Mackay.— " Black-eyed Marrowfat, male.
Agnes.—Large White Marrowfat, female, Pride, male.
Bruce.—Black-eyed " Mummy, male.
Carleton.—Mummy, female, Multiplier, male.
Duke.— " Black-eyed Marrowfat, male.
Trilby.—Black-eyed Marrowfat, female, Mummy, male.
Kent.—Mummy, female, Black-eyed Marrowfat, male.

EXPERIMENTS WITH FLAX.

The area sown with flax in Manitoba in 1895 according to government returns was over 82,000 acres, this was all grown for the seed and in no case was the fibre utilized, the general impression being that the fibre of flax grown in this province is unfit for manufacturing purposes. There are also differences of opinion as to the best time for sowing, and the quantity of seed which should be used per acre.

This year eight $\frac{1}{10}$ acre plots were sown at four different dates with selected flax seed, four of these were sown with 40 pounds of seed per acre and four with 80 pounds, they were sown on a rich black loam well prepared.

One-half of each plot was pulled for the fibre as soon as the seed pods had turned brown, the other half of the plot was left until the seed had ripened when it was cut and threshed in the usual way.

A bale of the pulled flax from each plot was forwarded to one of the best Ontario flax mills to be manufactured into fibre, so that its fitness for commercial purposes might be tested.

Variety.	Amount of Seed sown per Acre	Date of Sowing.	Date of Ripening	Number of Days Maturing.	Length of Straw.	Date when pulled for Fibre.	Weight of Straw when pulled for Fibre per Acre.	Yield per Acre.		Weight per Bushel.	Weight of Straw when cut, per Acre.
	Lbs				In.		Lbs.	Bush.	Lbs.	Lbs	Lbs.
Flax....................	40	May 16	Aug. 14	90	34	Aug. 4	1,100	13	32	56	540
"	80	" 16	" 14	90	30	" 4	1,250	17	8	56	740
"	40	" 23	" 16	85	34	" 8	1,180	15	10	56	600
"	80	" 23	" 16	85	36	" 5	1,200	15	40	56	720
"	40	" 30	Sept. 1	94	34	" 18	1,900	16	4	56	950
"	80	" 30	" 1	94	30	" 18	1,230	16	50	56	954
"	40	June 6	" 10	96	32	" 25	1,130	12	8	56	820
"	80	" 6	" 10	96	35	" 25	1,270	17	26	56	1,070

RESULTS OF SOWING CLOVER WITH GRAIN.

Ten acres of land was set apart last season for growing Mammoth Red Clover with different kinds of grain.

The objects in view in undertaking this experiment were :—

1st. To ascertain whether the sowing of the clover would affect the yield of grain.

2nd. Whether after the grain was cut the clover would grow sufficiently strong to furnish a fair mat of foliage for ploughing under, and

3rd. To ascertain how the clover succeeds with each of these crops.

The field was divided into twenty, one-half acre plots ; eight of these plots were sown with barley and the balance to wheat, oats and pease, four plots of each kind of grain, and every alternate plot was sown with Mammoth Red Clover at the rate of ten pounds per acre.

The clover seed was sown broadcast at the same time as the grain and lightly harrowed in, the alternate plots were left without clover, as check plots. The field selected for this experiment was not very uniform in character and quality of soil, but fairly so. It was a clay loam and was prepared, and the grain sown at as early a date as possible.

The yields are fairly uniform except in the case of Red Fife and French Chevalier barley and the want of uniformity in these is accounted for by their being on the extreme edges of the field and at the foot of higher slopes, where the land was lighter.

It will be seen by the appended table that all the varieties of grain except pease and Banner oats averaged a higher yield than they did in the $\frac{1}{10}$ acre plots, probably owing to a greater freedom from rust on the stiff clay soil of this field.

Contrary to expectations, the pea plots produced the best stand of clover.

The plants in these plots were sufficiently thick for a meadow, but the growth after the grain was cut was very slight and the roots were very small when winter set in. The clover plants on all the plots were very weak, and not nearly thick enough for a meadow.

With the object of testing the hardiness of the clover all the plots were left undisturbed last fall and at this date are well covered with snow.

The appended table gives particulars regarding this test :—

Name of Variety.	Remarks.	Sown.	Ripe.	Yield.	
				Bush.	Lbs.
Red Fife Wheat	Clover weak and thin, few roots	May 11	Sept. 3	33	40
" "	Check plot, no clover sown	" 11	" 3	23	4
Advance "	Clover weak and thin, few roots	" 11	" 3	38	30
" "	Check plot, no clover	" 11	" 3	34	20
Mummy Pease	Clover fairly thick, small roots	" 19	Aug. 30	39	36
" "	Check plot, no clover	" 19	" 30	40	20
Potter "	Clover fairly thick, small roots	" 19	" 31	38	22
" "	Check plot, no clover	" 19	" 31	37	22
Abundance Oats	Clover very weak and thin, few short roots	" 19	Sept. 1	87	20
" "	Check plot, no clover	" 19	" 1	84	28
Banner "	Clover weak and very thin, few short roots	" 19	" 1	104	
" "	Check plot, no clover	" 19	" 1	94	26
Odessa Barley	Clover weak and thin, few roots	" 19	Aug. 19	74	18
" "	Check plot, no clover	" 19	" 19	76	2
Trooper "	Clover weak and thin, few roots	" 19	" 21	67	24
" "	Check plot, no clover	" 19	" 21	68	26
Sidney "	Clover very weak and thin, few roots	" 20	" 25	68	36
" "	Check plot, no clover	" 20	" 25	67	34
French Chevalier Barley	Clover weak and thin, few roots	" 20	" 31	76	22
" "	Check plot, no clover	" 20	" 31	57	34

GRASSES AND FODDER PLANTS.

The unusually heavy rain-fall early in the season was very beneficial to grasses of all kinds resulting in the heaviest crop ever grown here.

The area sown to grass on this farm has increased each year until the supply of hay required for the stock is now all procured from cultivated land, there are several advantages in this plan over cutting from wild meadows.

1st. It can generally be procured nearer the buildings.

2nd. The hay is freer from weeds and rubbish.

3rd. It is possible to cut the cultivated grasses earlier in the season and so complete the haying before harvest commences.

4th. The texture of the soil is improved and danger from drifting is lessened if the land is seeded to grass occasionally.

A native grass to which my attention has been repeatedly called and which has invariably given a large yield is Reed Canary Grass (*Phalaris arundinacea.*) This is a tall coarse perennial grass with a flat and broad leaf, which grows naturally in wet

places, but succeeds on dry cultivated land, it is highly recommended for hay by settlers living in the northern parts of the province, but it has not yet been fed to any extent on this farm ; as soon as a sufficient area can be grown its suitability for fodder will be tested.

The following table gives particulars of the yields, &c., of the several native grasses growing under cultivation ; Awnless Brome Grass is treated elsewhere in this report.

The upland Timothy fields three years sown were useless this year, and have been ploughed up and the newly sown fields will not be fit to cut until next year.

A timothy field in the valley three years old which is overflowed each year, gave 1 ton 1175 pounds of hay per acre.

Name of Variety.	When cut for hay	Crop.	Area.	Tons.	Lbs.
Western Rye Grass (*Agropyrum tenerum*)........	July 27...	1st......	$\frac{1}{10}$ acre .	4	560
" " "	" 22...	3rd.....	3 acres..	1	330
Bald Rye or Wheat Grass (*Elymus virginicus*)............	" 22...	1st......	$\frac{1}{10}$ acre .	4	850
" " "	" 19...	3rd.....	$\frac{1}{2}$ " .	1	637
American Rye Grass (*Elymus americanus*).....	" 19...	" . .	2 acres..	1	1,974
Reed Canary Grass (*Phalaris arundinacea*)...............	Aug. 12...	2nd.....	$\frac{1}{10}$ acre .	1	1,900

In addition to the above 78 plots of native and imported grasses and clovers were sown this year, these were divided into three series with the following objects in view :

1st. To test the hardiness and suitability of the different varieties to this climate.
2nd. To try different modes of sowing.
3rd. To ascertain the proper amount of seed necessary for this country.

Nearly all the varieties germinated well and when winter set in they covered the ground and were from three to twelve inches high. It is hoped that some of these may prove hardy and useful.

MIXED GRAIN CUT GREEN AND CURED FOR HAY.

Throughout the western portions of the province there is an increased consumption each year of mixed grain for fodder. The ease with which this crop can be raised, the large returns obtained, and its suitability for all kinds of stock are becoming better understood each year. For the purpose of gaining further information as to the best mixtures for this purpose ; six plots were sown with oats and pease, and oats and tares, in varying proportions ; from the annexed table it will be seen that the returns were large in every instance, but the mixture of tares and oats gave a larger yield in every case than the oats and pease ; the tares also made finer and apparently better fodder.

The plots were one-tenth acre in area, the soil was a clay loam, and the previous crop was fodder corn.

The tares were grown from seed ripened on this farm during 1895

Mixture.	Length of Straw.	Stage when cut.	Yield of dry hay per acre. Tons.	Lbs.
No. 1.	Inches.		Tons.	Lbs.
1 bush. English Tares.................................per acre.	36	Early milk..	4	900
2 " Banner Oats.................................. " .	50	Late " ..		
No. 2.				
1½ bush. English Tares. ... .per acre.	36	Early milk..	4	650
1½ " Banner Oats.................................. " .	48	Late " ..		
No. 3.				
2 bush. English Tares............................ .... per acre	36	Early milk..	3	1,750
1 " Banner Oats.................................. ... " .	51	Late " ..		
No. 4.				
1 bush. Canadian Beauty Pease..........................per acre.	50	Late milk...	3	1,700
2 " Banner Oats.................................. ... " .	52	" ..		
No. 5.				
2 bush. Canadian Beauty Pease...........................per acre.	52	Late milk...	3	1,500
1 " Banner Oats...... .... " .	52	" ..		
No. 6.				
1½ bush. Canadian Beauty Pease...... .... per acre.	53	Late milk...	3	750
½ " Banner Oats... .... " .	43	" ..		

AWNLESS BROME GRASS *(BROMUS INERMIS).*

This grass is growing so rapidly in favour that a few notes on its cultivation on this farm may prove of interest.

It is a perennial grass, and a native of Europe. It has a tall stalk with a spreading head and the plant is well provided with leaves. It is relished both by horses and cattle; calves being particularly fond of the tender leaves, and judging from the analysis of this plant as given by the Chemist of the Experimental Farms, Mr. F. T. Shutt, on page 189 of the annual report for 1893, it is very nutritious.

ITS SUITABILITY FOR PASTURE

As a pasture grass for this province it is perhaps unequalled, starting early in spring it is fit to pasture two weeks earlier than our native grasses, thus admitting of cattle being turned on it much sooner; the aftermath late in the summer is also heavy. This year the Experimental Farm cattle were pasturing on it up to the first of November, and when snow came it was still several inches high and quite green; there is no question that this grass will materially assist in keeping up a flow of milk in the autumn months when native pastures are dried up, thus overcoming one of the greatest drawbacks to dairying here, viz., the shortness of the season

ITS PERSISTENCY.

A field of this grass was sown on the Experimental Farm in the spring of 1890, and has borne crops of hay every year since, the first four crops averaged from $1\frac{1}{2}$ to $2\frac{1}{2}$ tons per acre, last year (the fifth crop) the plants sent up very few stalks and the crop was scarcely worth cutting for hay but made fair pasture, this year's heavy rainfall revived the plants and over two tons of hay per acre were cut.

HOW TO SOW.

Three different plans for seeding with this grass have been adopted on the Experimental Farm.

1st. The grass seed is sown broadcast by hand with a grain crop, preferably with wheat, this is done just before or after the grain is sown, when the one harrowing will cover both lots of seed ; to avoid burying the grass seed too deep it should not be sown on rough ploughed land until it has been harrowed at least once.

The objection to sowing this grass with a crop of grain is, that should a drought follow, the grain having the stronger growth absorbs all the moisture leaving the tiny grass plants to perish, and should the season be a wet one or the soil strong, the grain will lodge and smother out the grass.

2nd. A better plan and the one generally adopted is to sow the grass seed on spring ploughed stubble, in the month of May or early in June, weeds and some volunteer grain will come up with the grass, but these can be cut down before they seed, without injuring the growth of the young grass ; the only objection to this plan is that some of the shorter weed plants, in spite of every precaution, will escape the mower and go to seed, and the crop of grass the next year will be more or less mixed with weeds.

3rd. On farms not subject to drifting by winds, the better plan is to prepare the land as for summer-fallow by ploughing in May or early in June, followed by harrowing or cultivating until about 15th July, when the seed can be sown and harrowed in, the seed will germinate in the moist fallowed land at once, and the young plants will have made a good stand by winter ; if the cultivation has been thorough the surface soil will be quite free of weeds, and the crop of grass the following year clean, this is an excellent plan to follow when the grass is intended to be saved for seed as the sample is almost sure to be pure and clean.

On soils liable to injury from wind this plan is not to be recommended, as the well worked soil is very apt to drift and expose the grass seed to injury, or it may be partially blown away.

From fifteen to eighteen pounds of seed is sufficient per acre to ensure a good crop ; at this rate of sowing the plants are not crowded and large crops of hay can be secured for the first two or three years, and if by that time the grass becomes too thick it can be pastured.

GROWING THE SEED.

This grass produces an abundance of seed which weighs fourteen pounds per bushel, the yield of seed this year on a $4\frac{1}{2}$ acre field was 511 pounds per acre.

Several visitors to the farm last summer from the United States expressed surprise at the fine crop of Brome seed growing here, and stated that an almost unlimited market could be found in the neighbouring republic, for this seed where they found it impossible to grow it to the same degree of perfection. It is found here that the ripening of a crop of seed materially lessens the yield of hay the following year, but does not appear to injure the grass for pasture.

ITS EXTERMINATION.

Owing to the many branching roots of this plant some anxiety has been expressed regarding the danger of its spreading and becoming a weed, in the six years it has been growing on this farm, none of the plants have spread and on a plot broken thinly imme-

Field of Awnless Brome Grass at the Experimental Farm at Brandon, Manitoba.

diately after haying and back-set this fall, it was found that the sod was well rotted, and apparently all the plants killed; another field, however, that was allowed to ripen its seed and then ploughed late in August was not well rotted when back-set this fall, and many of the plants were quite green.

For the complete extermination of the plants the sod should be broken early and then back-set in good time.

The appended table shows the yield of Brome grass since it was first sown here, (with the exception of 1892), with character of soil, area of fields, &c.

Date.	Yield of hay.		Crop.	Age of grass.	How situated.	Character of soil.	How sown.	Area.
	Tons.	Lbs.						
1891........ ..	2	1,105	1st.	2 years.	Valley......	Black loam.........	With grain.......	$\frac{1}{10}$ acre.
1893.....	1	333	3rd.	4 " .	"	"	"	$\frac{1}{10}$ "
1894	..	1,668	4th.	5 " .	"	"	"	$\frac{1}{10}$ "
1895.....	1	950	2nd	3 " .	Undulating.	Sandy loam.........	On summer fallow.	$1\frac{1}{5}$ "
1896......	2	80	2nd	3 " .	Side hill....	"	With grain.......	$1\frac{1}{4}$ "
1896.	2	359	5th.	6 " .	Valley......	Black loam.........	"	$\frac{1}{10}$ "
1896..........	1	1,252	2nd	3 " .	Undulating.	Very gravelly loam..	"	$3\frac{1}{4}$ "

GROWING HUNGARIAN GRASS SEED.

A large quantity of Hungarian grass seed is imported into the province each year, and much of it is more or less mixed with weed seeds. Trial plots were sown to see if the seed could be produced to advantage in this climate.

This year two plots $\frac{1}{10}$ acre each were sown on 27th May, with 23 pounds of seed per acre, a grain drill being used for the purpose, one plot was cut on August 12th producing 4 tons 1,250 pounds of hay per acre, the other plot was cut for seed after the first frost, but produced only 250 pounds per acre of very light seed. The season this year was too short to ripen plants from imported seed sown at the date given. Possibly plants from the home grown seed may mature earlier; or it may be advantageous to sow earlier. Further experiments along this line will probably be tried.

GRASS SEED DISTRIBUTION.

The interest in grasses is increasing rapidly among farmers, and last season we were unable to supply all the applications for samples of seeds. Two hundred and sixty-one 1 lb. bags were sent out. These included three of the most promising of the native varieties, also the Awnless Brome grass. A larger quantity of grass seed was saved during the past season, sufficient probably to supply all those who wish to test these grasses.

EXPERIMENTS WITH INDIAN CORN.

The abundant rainfall and high temperature of the past season has been favourable to a large yield of fodder corn, and the returns were satisfactory; and many varieties were well advanced towards maturity before severe frost occurred.

Some large examples were grown this year, especially of the varieties known as Cuban Giant and Early Mastodon, which reached ten feet in height. But all these tall dent varieties are much too late for this climate, and earlier and shorter-growing varieties are much more valuable.

The North Dakota Flint, as we have grown it here, has a yellow kernel; another variety, bearing the same name but with a white kernel, has been sold quite extensively in the province, and judging from this year's experience it appears to be inferior to the yellow variety, the yield of fodder being nearly five tons per acre less, and it matures no earlier.

CORN—TEST OF VARIETIES.

All were sown after millet, no manure was used; the soil was a rich sandy loam; sown May 23rd with a press drill, drills three feet apart, plants one foot apart in the drill, also in hills three feet apart each way; kept clean with one-horse cultivator. One row was cut on August 19th and immediately weighed, and for the purpose of ascertaining how far the varieties would mature, the other row was left standing for eleven days longer, when severe frosts cut them down. As the weather was cool during those eleven days, very little additional growth was made. The yield per acre has been calculated in each case from the weight of two rows, each 66 feet long.

Name of Variety.	Description of Variety.	Height.	Leafiness.	When tasselled.	In Silk.	Early Milk.	Condition when cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
		In.						tons.	lbs.	tons.	lbs.
Angel of Midnight.	Yellow Flint	106	Leafy	Aug. 3	Aug. 7	Aug. 14	Early milk	36	600	24	1500
Longfellow.......	"	87	"	July 30	" 6	" 15	" "	30	500	27	1000
Pearce's Prolific...	"	101	"	" 31	" 10	" 15	" "	26	800	23	200
North Dakota Yellow.	"	98	"	" 30	" 4	" 10	Late "	26	800	23	1300
Canada White Flint.	White Flint.	110	Very leafy..	" 31	" 6	" 20	Early "	24	1500	26	800
Leaming.........	Dent.	105	Fairly " ..	Aug. 10	Sept. 1	....	Tasselled..	24	400	26	800
Thoroughbred White Flint.	White Flint.	103	Very " ..	" 4	" 1	... .	" ..	24	400	19	600
Pride of the North.	Yellow Dent	100	Few leaves..	" 10	....	....	" ..	23	200	22	
Red Cob Ensilage.	White "	100	Leafy	" 15	Sept. 1	....	" ..	23	200	27	1000
Sanford.	Flint......	102	"	July 31	Aug. 4	Aug. 15	Early milk	23	200	24	400
King of the Earliest.	Dent.	103	Fairly leafy.	" 31	" 4	" 11	Late "	22		25	600
Mitchells Extra Early.	White Flint.	72	Very " .	" 20	July 25	" 4	" "	21	900	22	
Early Huron Dent.	Red & Yellow Dent.	103	Very few leaves.	" 31	Aug. 7	" 16	Early "	21	900	26	800
North Dakota White.	White Flint.	80	Leafy	" 25	July 31	" 4	Late "	21	900	24	400
Country Gentleman	" Dent.	85	"	Aug. 10	Sept. 1	....	Tasselled..	20	1800	17	1200
Cuban Giant	....	113	Very leafy..	" 10	Aug. 17	....	Silk..	20	1800	28	1200
Giant Prolific Ensilage.	....	102	Few leaves..	" 7	Sept. 1	....	Tasselled..	19	1600	24	1500
Mammoth 8-rowed Flint.	Yellow Flint	100	Fairly leafy.	" 3	Aug. 7	Aug. 16	Early milk	19	500	19	1600
Compton's Early..	"	107	Leafy	" 1	" 6	" 15	"	19	500	26	800
Champion White Pearl.	White Dent.	100	Fairly leafy.	" 5	Sept. 1	....	Tasselled..	18	1400	26	800
Early Mastodon ..	Dent. ...	115	Very " .	" 10	Aug. 17	....	Silk......	18	1400	22	1100
White Cap Yellow Dent.	Yellow Dent	103	Leafy	" 4	" 11	Aug. 17	Early milk	16	1000	28	1200
New White Cap Yellow Dent.	"	100	Few leaves..	" 1	" 16	" 25	"	15	800	22	

THICK AND THIN SOWING OF FODDER CORN.

Some farmers have the impression that fodder corn should be sown thick for the best results. With a view of testing this matter, two $\frac{1}{10}$ acre plots were sown with North Dakota Yellow Flint; both were sown with a Superior Wheat Drill; in one case

all the spouts were allowed to run, making the drills seven inches apart, and the plants 3 to 6 inches apart in the row. In sowing the other plot, sufficient drills were stopped to make the rows three feet apart, and the plants were thinned out to nine inches in the row. The fodder on the thick-sown plot was very sappy and few ears were formed, while on the thin-sown many well matured ears were formed, and the fodder was of excellent quality.

Variety.	Width of Drills.	Distance between Plants.	Height.	Yield per Acre.	Quality of Fodder.
		Inches.	Feet.	Tons. Lbs.	
North Dakota Flint. ...	3 feet......	9 to 10	7 to 9	20 00	Well matured, dark green colour.
" "	7 inches....	3 to 6	5 to 6	19 250	Very sappy and bleached.

Besides the test plots of corn, a large field of North Dakota Flint was grown, after wheat on strong black loam slightly inclined to the south. The land was spring ploughed and well harrowed, the corn was then sown in drills three feet apart with a superior wheat drill, the entrance of any unused spouts being closed with an empty bag, somewhat less than half a bushel of seed was used per acre, which gave a very even stand of plants, four to nine inches apart, the land was harrowed both before and after the plants appeared above the ground with the result that very little hand labour was required to keep it clean, and a crop of over twenty tons of green fodder per acre in the late milk stage was secured. As much of it was nine feet high and difficult to cut with a binder, all was harvested with sickles and left in loose bundles on the ground ready to be drawn (when wilted) to the silos or to the stack to be mixed with straw for dry fodder.

SUMMARY.

After several years' experience, I am confirmed in the opinion that corn is one of the most suitable fodder plants for Western Manitoba, but for the best results, the following points must be borne in mind :—

1st. Land selected for this crop should be naturally warm and undulating.

2nd. The variety of seed used should be an early ripening one with abundant foliage.

3rd. The culture should be clean and as far as possible done when the corn plants are very small and just as the weeds are appearing above ground.

4th. The crop must be cut before severe frost, and as few farmers are willing to leave wheat harvest when it is once started, we have found it advisable to recommend cutting corn before wheat harvest is begun, even if this necessitates the corn being cut somewhat immature.

SILOS.

The crop of fodder in 1895 was badly injured by frost, the stalks having been cut down to within three feet of the ground (see page 294 annnual report for 1895) and some anxiety was felt as to the quality of ensilage made from it ; the corn was cut within a day or two after the frost, bound in sheaves, allowed to wilt for over a week and then run through the cutting box and into the silos.

On opening the silos in December the ensilage was found to be excellent and very little if any inferior to that made from unfrozen corn.

A few rows of corn were left standing for some days after the frost until the stalks were bleached white and then cut, these were almost without sap or taste and were not relished by the cattle.

It would appear from this that frozen corn should be cut as quickly as possible after a frost.

This year the area in corn was less than usual and the lower part of each silo was filled with a mixture of oats and pease, cut when in bloom, wilted slightly, and then run through the cutting box and into the silos, as this mixture was rather bulky, green corn was placed above it giving the required pressure, the silos have not yet been opened, but notes will be taken during the winter of the quality of this ensilage, and published next year. The oats and pease were grown on land, which was too low and wet for corn and too late in drying for a grain crop, a portion of the crop was dried and stacked, and this will also be tested as feed for cattle. The yield from this field was 3 tons 1,770 pounds per acre of dry hay.

FIELD ROOTS.

The year has been a very favourable one for all kinds of field roots, and the returns have been the largest in the history of the farm.

The unusual plan of growing roots on the same ground for a number of years has been adopted on this farm. The kind of root is changed each year; for instance, turnips follow carrots one year and mangles the next, but all the field has been continually in roots for 3 years.

By this plan the work required in keeping the plots clean is reduced to a minimum and the usual lodging of grain crops after roots is avoided.

There are I know some objections that may be urged against this plan, but it has certainly given increasingly large yields each year, and the soil is now so free of weed seeds that very little work is required to keep it clean.

About twenty tons of well rotted manure was deeply ploughed in, late in the fall of 1894. No manure was used last year. No injury was done by insects during the past season; although adjoining farmers complain each year of the injury done by cut worms, we have had no trouble from this cause since the plan was adopted of clearing off all rubbish and ploughing the land intended for roots deeply in the fall.

Almost without exception the earliest sown plots again gave the largest yields, and we can safely assume that all field roots should be sown here, as early in May as frost will permit.

EXPERIMENTS WITH TURNIPS.

Fifteen varieties of turnips were tested this season sown at two different dates; the previous crop was carrots. The land was ploughed deeply in the fall; and the seed drilled in on the flat in drills thirty inches apart. The soil was a rich sandy loam; the estimate of yield has been made from the product of two rows, each sixty-six feet long. The roots are of good quality, and are free from rot.

The first plots were sown on the 18th May, the second on the 25th May, and all were pulled on the 8th October.

TURNIPS—Test of varieties.

Name of Variety.	Yield per acre. — 1st Plot.		Yield per acre. — 1st Plot.		Yield per acre. — 2nd Plot.		Yield per acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Hartley's Bronze	31	700	1045		19	808	646	48
Purple Top (home grown seed)	31	304	1038	24				
Perfection	28	1420	957		23	728	778	48
Prize Winner...	27	1968	932	48	18	1488	624	48
East Lothian	26	1724	895	24	16	208	536	48
Purple Top Swede............	26	1460	891		16	472	541	12
Skirvings.....................	25	1876	864	36	25	1480	858	
Mammoth Clyde	25	556	842	36	25	160	836	
Selected Champion.................	22	1012	750	12	19	280	638	
Sutton's Champion	21	1296	721	36	19	280	638	
Giant King	20	1976	699	36	17	320	572	
Carter's Elephant	19	940	649		16	1528	558	48
Jumbo or Monarch.................	19	148	635	48	16	1792	563	12
Marquis of Lorne................	18	1092	618	12	18	960	616	
Prize Purple Top	17	1640	594		18	1224	620	24

	Bush.	Lbs.
Average yield from all the sowings of 18th May, per acre.........	866	48
" " 25th " "	694	31

EXPERIMENTS WITH MANGELS.

The large yield of 1895 has been exceeded this year and the quality is also good

Fourteen varieties of mangels were grown this season, sown at two different dates. The first set of plots were sown on the 16th of May, the second on 1st June, and all were pulled 3rd October. They were sown after turnips, the soil was a rich sandy loam, which was ploughed deeply in the fall; the seed was sown in flat drills 30 inches apart, and the yields per acre have been estimated from the product of two rows each 66 feet long.

MANGELS—Test of varieties.

Name of Variety.	Yield per acre. — 1st Plot.		Yield per acre. — 1st Plot.		Yield per acre. — 2nd Plot.		Yield per acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Mammoth Long Red (Webb)........	52	1600	1760		34	1168	1152	48
Golden Tankard.............	45	1080	1518		32	416	1073	36
Giant Yellow Intermediate	43	1648	1460	48	33	792	1113	12
Gate Post..........................	43	1120	1452		34	640	1144	
Mammoth Long Red (Steele).......	43	1120	1452		35	1016	1183	36
Champion Yellow Globe..........	41	1688	1394	48	28	1288	954	49
Yellow Intermediate......	38	1616	1293	36	21	1824	730	24
Canadian Giant	37	960	1249	36	34	112	1135	12
Giant Yellow Globe................	37	184	1236	24	26	1064	884	24
Mammoth Long Red (Evans).......	36	1920	1232		32	1208	1086	48
Red Oval Globe	32	680	1078		26	272	871	12
Golden Fleshed Tankard	31	1888	1064	48	27	1176	919	36
Warden Orange Globe	30	720	1012		26	1328	888	48
Red Fleshed Tankard	29	1664	994	24	14	1832	497	12

	Bush.	Lbs.
Average yield from all the sowings of 16th May, per acre..........	1299	53
" " 1st June "	973	58

EXPERIMENTS WITH CARROTS.

Fourteen varieties of carrots have been under test this year. The soil was a rich sandy loam which had been deeply ploughed up; the previous crop was turnips. The seed was sown in flat drills 18 inches apart, at two different dates, the first plots on the 16th May and the second on the 2nd of June, and all were pulled on the 5th of October.

The yields per acre have been calculated from the product of two rows, each 66 feet long.

CARROTS.—Test of Varieties.

Name of Variety.	Yield per acre. — 1st Plot.		Yield per acre. — 1st Plot.		Yield per acre. — 2nd Plot.		Yield per acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Early Gem	27	1880	931	20	18	1400	623	20
Iverson's Champion	25	380	839	40	20	480	674	40
Giant Short White Voges	24	1500	825	..	20	1800	696	40
Improved half-long White	24	1280	821	20	20	40	669	20
Guerande or Ox Heart	24	620	810	20	21	1560	726	..
White Belgian	23	860	781	..	16	1000	550	..
Mammoth White Intermediate	22	1980	766	20	16	1000	550	..
Chantenay	22	440	740	40	13	400	440	..
Yellow Intermediate	21	1120	718	40	21	240	704	..
Scarlet do	20	1800	696	40	12	200	403	20
Improved Short White	19	500	641	40	16	1880	564	40
Long Orange or Surrey	18	300	605	..	16	1880	564	40
Carter's Orange Giant	17	1200	586	40	11	440	374	..
Long Scarlet Altringham	13	1060	451	..	13	840	447	20

	Bush.	Lbs.
Average yield from all the sowings of 16th May, per acre	729	40
" " 2nd June "	570	34

EXPERIMENTS WITH SUGAR BEETS.

The following are the yields obtained from three varieties of sugar beets sown at two different dates on rich sandy loam treated the same as mangels.

The first plots were sown on the 16th May and the second on the 1st June.

All were pulled on the 3rd October; and the yield per acre has been calculated from the produce of two rows each 66 feet long.

ROOTS.—Sugar Beets.

Name of Variety.	Yield per acre. — 1st Plot.		Yield per acre. — 1st Plot.		Yield per acre. — 2nd Plot.		Yield per acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Lane's Sugar Beet	31	1096	1051	36	23	728	778	48
Austrian Electoral	29	344	972	24	20	1184	686	24
Vilmorin's Improved	18	1224	620	24	20	1448	690	48

	Bush.	Lbs.
Average yield from all the sowings of 16th May, per acre	881	28
" " 1st June "	718	40

EXPERIMENTS WITH POTATOES.

The prevailing conditions so favourable for field roots were suitable also for potatoes, and not only was the crop a large one but it was grown with less than the usual amount of manual labour.

The land selected was in millet last year and was ploughed deeply as soon as it was dry in spring, then harrowed at intervals of a week or ten days so as to kill weeds. On the 21st May the land was again ploughed but shallow and the tubers cut in pieces with 2 or 3 eyes each were planted in every third furrow ; after planting the harrows were again used as often as weeds appeared until the plants were four inches high, by this treatment no hoeing was required and the field was quite clean of weeds throughout the season.

This province is noted for its large yields of excellent potatoes, the average prairie soil in nearly all districts being well adapted to the growth of this vegetable, and with attention to a few important particulars potatoes can I think be raised cheaper in this province than in any other part of the Dominion.

From several years experience it would appear that success in growing this crop with profit depends principally on the following :

1st. The selection of a rich, well drained black loam soil.

2nd. Planting only early ripening varieties, of known productiveness.

3rd. Planting the seed as soon as possible after 20th May, so as to get the advantage of as long a season as possible.

4th. Destroying weeds when small with the harrow, this not only kills the weeds but provides a mulch of loose soil preventing injury from drought.

Eighty-four varieties were planted this year of which a large number were new sorts.

It is noticeable that many varieties at the head of this year's list were also large producers last season, Pearce's Extra Early taking the lead both years, this is an excellent variety in every respect and worthy of more extensive planting.

Not a rotten potato was found in any of the plots and scarcely any scab.

All the varieties were planted 21st May on black sandy loam soil, without manure, and were dug on the 9th September. The yield per acre has been estimated in each case from the product of one row 66 feet long.

POTATOES—Test of Varieties.

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Yield per Acre. Total. Bush.	Total. Lbs.	Market-able. Bush.	Market-able. Lbs.	Unmar-ketable. Bush.	Unmar-ketable. Lbs.	Form and Colour.
Pearce's Extra Early.	Rank	Sept. 1..	Large	Good, dry .	601	20	594	..	7	20	Oval, light pink.
Rural Blush.........	Very rank	Late	"	" ..	531	40	513	20	18	20	" "
Early Sunrise	Fair......	Sept. 1..	"	Fair.. ...	517	..	484	..	33	..	" "
Early Norther.......	Rank ...	" 15..	"	"	513	20	506	..	7	20	" dark pink.
Early Puritan.......	Very rank	Late	"	Good, dry..	506	..	476	40	29	20	Round, white.
I. X. L............	" ..	"	"	" ..	502	20	465	40	36	40	" light pink.
Pearce's Prize Winner	Fair.....	Sept. 15..	"	" ..	498	40	462	..	36	40	Oval, white.
Early White Prize...	" ...	" 1..	"	Wet, fair...	487	40	454	40	33	..	" "
Irish Daisy	Very rank	Late	"	Slightly wet.	484	..	447	20	36	40	Round, white.
World's Fair........	" ..	"	" ...	Good, dry..	484	..	425	20	58	40	" "
Everett	Fair......	Sept. 15..	"	" ..	480	20	465	40	14	40	" pink.
Polaris....	Rank	" 15..	"	Damp...	473	..	451	..	22	..	Oval.
White Beauty.......	Fair.....	" 1..	"	Good, dry..	469	20	451	..	18	20	" white.
Pride of the Market..	Very rank	Very late.	" ...	" ..	469	20	458	20	11	..	" "
Flemish Beauty Seedling..............	" ..	" ..	"	" ..	465	40	454	40	11	..	" light pink.
Clarke's No. 1.......	" ..	" ..	"	" ..	458	20	447	20	11	..	" "
Daisy.......	Fair......	Sept. 1..	"	" ..	458	20	440	..	18	20	" "
Bêauty of Hebron...	Very rank	" 15..	"	" ..	454	40	429	..	25	40	" "
Empire State........	" ..	Very late.	"	Fair........	454	40	432	40	22	..	Round, white.
Late Puritan........	" ..	" ..	"	"	454	40	440	..	14	40	Oval "

POTATOES—TEST OF VARIETIES—*Continued.*

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Yield per Acre. Total.		Marketable.		Unmarketable.		Form and Colour.
					Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Wonder of the World.	Rank	Sept. 1..	Large	Good, dry..	447	20	436	20	11	..	Oval light pink.
Money Maker....	″ ..	″ 15..	″	″ ..	440	..	......		....		″ white.
Carman No. 1......	Very rank	Very late.	″	″ ..	440	..	421	40	18	20	
Lizzie's Pride..	Rank	Sept. 15..	″	″ ..	436	20	421	40	14	40	
Great Divide........	″	″ 15..	″	″ ..	436	20	399	40	36	40	″ ″
Early Gem.........	Weak	″ 15..	″ ...	Yellow,d'mp	429	..	410	40	18	20	″ light pink.
New Queen..........	Rank	″ 1 .	″	Fair.......	421	40	403	20	18	20	″ ″
Lee's Favourite......	Fair.....	″ 1..	″	Good, dry..	418	..	403	20	14	40	″ ″
Lightning Express...	Very rank	Late......	″	″ ..	410	40	388	40	22	..	
State of Maine	″ ..	″	″	Fair......	410	40	392	20	18	20	Round, white.
London.......	Fair......	Sept. 1..	″	Good, dry..	399	40	392	20	7	20	″ light pink.
Crown Jewel	″	Aug. 28..	″	″ ..	396	..	381	20	14	40	Oval ″
Chicago Market.....	″	Sept. 1..	″	Choice......	396	..	385	..	11	.	″ white.
Hale's Champion	Rank	″ 15..	″	Good, dry..	396	..	385	..	11	..	
Queen of the Valley..	″ ..	Late......	″ . . .	″ ..	396	..	385	..	11	..	Round,dark pink
Reading Giant	Fair......	Sept. 15..	″	Wet, poor ..	385	..	366	40	18	20	″ very dark ″
Chas. Downing......	″	″ 1..	″	Good, dry..	381	20	366	40	14	40	Oval, white.
Early Six Weeks	Weak	Aug. 20..	Medium..	Fair........	377	40	366	40	11	..	Round,dark pink
Thorburn....	Fair......	Sept. 1..	Large ...	″	377	40	370	20	7	20	Oval ″
Northern Spy........	Rank ...	Very late.	″	Good, dry..	377	40	366	40	11	..	″ ″
Earliest of all........	Medium..	Sept. 1..	″	″ ..	377	40	366	40	11	..	″ light pink.
Brownell's Winner...	Very rank	Late......	″	Fair........	374	..	366	40	7	20	″ ″
Blue Nose...........	Rank	Sept. 15..	Medium..	Little damp.	370	20	348	20	22	..	Round, purple.
McKenzie.....	Fair......	″ 15..	Large	Choice......	370	20	359	20	11	..	″ white.
Early Harvest.......	″	Aug. 25 .	″	″	366	40	359	20	7	20	Oval ″
Delaware............	Very rank	Very late.	″	Damp . .	366	40	359	20	7	20	″ ″
Early Rose..........	Fair......	Sept. 15..	″	Good, dry..	366	40	359	20	7	20	″ light pink.
General Gordon	Rank	″ 15..	Medium..	″ ..	363	..	352	..	11	..	″ dark pink.
Maggie Murphy.....	Fair......	″ 15..	Large	″ ..	363	..	......		......		Round ″
Prize Taker..........	Very rank	″ 15..	″	″ ..	359	20	352	..	7	20	Oval ″
New Variety No. 1..	Rank . ..	″ 15..	″	Damp ...	355	40	293	20	62	20	″ light pink.
Early Ohio	Weak	Aug. 20..	Large	Very choice.	355	40	344	40	11	..	Round, d'rk pink
Burnaby Seedling....	Fair.. ...	Sept. 15..	″	Good, dry...	348	20	333	40	14	40	Oval, light ″
Rochester Rose......	Rank	″ 1..	″	Wet, yellow.	344	40	333	40	11	..	″ ″ ″
American Wonder...	″	″ 15..	″	″	344	40	333	40	11	..	″ white.
Troy Seedling........	Fair..	Late....	″	Good, dry...	344	..	330	..	14	40	Round, white.
Vanier	Very rank	Sept. 15..	″	″ ..	344	40	333	40	11	..	Oval, dark pink.
Dreer's Standard ..	″ ..	Very late.	″	Fair..	344	40	.. .		.....		″ white.
Sharpe's Seedling....	Fair..... .	Sept. 1..	″	Choice.. .	341	..	330	..	11	..	″ light pink.
Monroe County	″	Late......	″	″	341	..	330	..	11	..	″ dark ″
Seedling No. 230.....	″	Sept. 1..	″	″	341	..	326	20	14	40	Round, white.
Record	Rank	Very late.	Medium..	Fair........	333	40	289	40	44	..	″ ″
Pride of the Table...	Fair..	Late......	Large .	Good, dry..	330	..	322	40	7	20	″ very d. pink
Burpee's Extra Early.	″	Aug. 25..	″	″ ..	330	..	319	..	11	..	Oval, light pink.
Stourbridge Glory ...	Very rank	Very late.	″	Yellow, dry.	326	20	293	20	33	..	″ white.
Ideal................	Fair.. ...	Sept. 15..	″	Fair... ...	326	20	315	20	11	..	″ dark pink.
Freeman	″	″ 1..	″ ...	Wet, fair....	322	40	311	40	11	..	Round, white.
Victor Rose..........	″	″ 15..	″	″ poor...	319	..	311	40	7	20	
Green Mountain.....	Rank.....	Late.... .	″	Good, dry...	311	40	300	40	11	..	″ ″
American Giant......	″	″	″	Fair, dry....	308	..	293	20	14	40	Oval ″
Algoma No. 1	Weak	Aug. 25..	″	Choice......	297	..	289	40	7	20	Round, d'k pink.
Satisfaction.........	Rank.....	Very late.	″	Good, dry...	293	20	282	20	11	..	Oval, white.
Hopeful.............	″	Late......	″	....	282	20	275	..	7	20	″ ″
Dakota Red....... .	″	Very late.	″ ..	Wet........	278	40	271	20	7	20	
Seedling No. 7......	″	″ .	Small.....	Damp, dark.	275	..	267	40	7	20	Round, d'k pink.
Harbinger...........	Fair......	Sept. 1..	Large	Fair, str'ked	275	..	267	40	7	20	Oval, light ″
Brown's Rot Proof...	Rank.....	Late......	Medium..	Wet ″ .	275	..	267	40	7	20	Round, d'k pink.
Seattle	Fair......	Sept. 15..	Large	Good.......	267	40	238	20	29	20	
Orphans	″	Late......	Medium..	Slightly wet	242	..	132		110	..	Oval, white.
Russell's Seedling....	Weak....	″	″ ..	Good, dry...	242	..	183	20	58	40	Round, white.
Peerless Junior	″	Very late.	Large	Fair, wet...	242	..	238	20	3	40	
Vick's Extra Early..	″	″ .	″	″	201	40	183	20	18	20	
Table King...... ...	″	Late......	Medium..	....	201	40	183	20	18	20	″ ″
Seedling No. 214.....	″	Aug. 25..	″ ..	Fair......	201	40	183	20	18	20	″ ″

AVERAGE YIELD OF POTATOES DURING FOUR YEARS.

On referring to my last year's report (page 300,) it will be seen that the average results given there for the preceding three years does not materially differ from the accompanying table which covers four years.

It is quite evident that there are a number of varieties equal to the Early Rose in quality and more productive than that variety; and the reports received from parties supplied with seed, tends to confirm this opinion.

Variety.	Years included.	Average yield per acre.		Quality.
		Bush.	Lbs.	
Pearce's Prize Winner	1893-94-95-96	323	25	Good.
" Extra Early	1893-94-95-96	318	57	"
Everett	1893-94-95-96	311	40	"
Polaris	1893-94-95-96	305	40	Fair.
Daisy	1893-94-95-96	286	55	Good.
Early Puritan	1893-94-95-96	279	55	"
Lee's Favourite	1893-94-95-96	277	45	"
Rural Blush	1893-94-95-96	277	42	Fair.
I. X. L.	1893-94-95-96	276	17	Poor
Crown Jewel	1893-94-95-96	269	57	Good.
Sharpe's Seedling	1893-94-95-96	268	..	"
Empire State	1893-94-95-96	267	30	Poor.
Early Sunrise	1893-94-95-96	264	35	Good.
Northern Spy	1893-94-95-96	262	52	Fair.
Early Rose	1893-94-95-96	258	30	Good.
State of Maine	1893-94-95-96	253	45	Fair.
Burpee's Extra Early	1893-94-95-96	248	25	Good.
Freeman	1893-94-95-96	242	50	Fair.
Clarke's No. 1	1893-94-95-96	242	50	Good.
Early Ohio	1893-94-95-96	239	40	"
Dakota Red	1893-94-95-96	233	15	Fair.
Algoma	1893-94-95-96	230	32	Good.
Beauty of Hebron	1893 — 95-96	215	45	"
Holborn Abundance	1893-94-95 —	206	20	Wet.

POTATO TEST OF VARIOUS CUTTINGS.

The above test was undertaken to ascertain the difference in yield and quality of potatoes when seed was planted, 1st whole, 2nd cut in two pieces and 3rd cut into four. The annexed table shows that the potatoes cut in two gave the largest yield of marketable tubers and their superiority was apparent all through the test. Those planted whole were very rough at every lifting. The variety of potato used in this test was the Early Ohio, which is one of the earliest sorts here.

Whole.					Cut in II.					Cut in IV.				
Date Lifted.	No. of Eatable.	No. of Small.	Weight.		Date Lifted	No. of Eatable.	No. of Small.	Weight.		Date Lifted	No. of Eatable.	No. of Small.	Weight.	
			Lbs.	Oz.				Lbs.	Oz.				Lbs.	Oz.
July 15	7	8	1	4	July 15	8	6	1	11	July 15	6	0	1	4
" 22	6	1	2	0	" 22	7	2	1	1	" 22	8	1	1	10
" 29	4	3	1	11	" 29	10	1	3	13	" 29	6	0	2	14
Aug. 5	8	3	3	6	Aug. 5	10	4	3	12	Aug. 5	6	3	3	7
" 12	11	6	5	0	" 12	5	3	3	2	" 12	5	5	3	4
" 20	9	2	5	0	" 20	6	4	4	4	" 20	6	0	4	0
Total	45	23	18	5	Total	46	20	18	11	Total	37	9	16	7
Average	$7\frac{1}{2}$·	$3\frac{5}{6}$·	3·	$0\frac{5}{6}$	Average	$7\frac{2}{3}$·	$3\frac{1}{3}$·	3	$1\frac{5}{6}$	Average	$6\frac{1}{6}$·	$1\frac{3}{6}$·	2·	$11\frac{5}{6}$

CATTLE.

The cattle on the farm have been healthy during the year, and there has been no losses through sickness.

The herd now consists of the following :—

Name of Animal.	Breed.	Age.	Weight.
Qu'Appelle Red Knight, bull	Shorthorn	3 years	1,980
Brandon Fashion, cow	"	3 "	1,220
Fashion's Lady, calf	"	1 month	160
Rideau Chief, bull	Ayrshire	3 years	1,450
Dandy, cow	"	7 "	1,140
Dandy Joe, bull calf	"	7 months	600
Princess Leda 2nd, cow	Holstein	7 years	1,400
Manitoba Prince, bull	"	3 "	2,050
Leda of Brandon, heifer	"	2 "	1,270
Leda's Princess of Brandon, calf	"	6 months	535
Duke of Eaton, bull	Polled Angus	3 years	1,680
Lady Jane Grey, cow	Grade	8 "	1,225
Topsey, cow	"	4 "	1,000
Daisy, cow	"	8 "	1,220
Pansy, cow	"	2 "	1,130
Violet, heifer	"	10 months	670
Jennie, heifer	"	8 "	560
Black Prince, steer	"	20 "	1,040
Fanny Fern, heifer	"	20 "	890

FEEDING STEERS.

A much larger number of steers were fed last winter than usual in this province, and in addition to the small bands fed by individual farmers, others have combined and erected large barns and are this winter feeding from fifty to one hundred head. This gives employment to a number of men, during the slack season, is a source of revenue to the province, and the export of so many prime cattle each year cannot fail to call attention to this province as a successful cattle-raising country.

As many Manitoba farmers are in doubt whether turnips can be fed to cattle with profit here, it was thought advisable last winter to make some feeding experiments on this line. For this purpose four steers were purchased from neighbouring farmers in December, at 2 cents per pound live weight, and sold in May at 3 cents per pound, these were very evenly matched short-horn grade steers, coming three years old. The four steers were divided into as nearly matched pairs as possible, and fed for 147 days all they would eat clean of the following ration :—

FIRST PAIR OF STEERS.

Cut straw	20 lbs.
Cut turnips	40 "
Wheat chop	5 "
Barley chop	2 "
Oat chop	3 "

SECOND PAIR OF STEERS.

Cut straw	20 lbs.
Wheat chop	5 "
Barley chop	2 "
Oat chop	3 "

The actual amount and estimated value of the feed consumed during the feeding period, 147 days, was as follows —

FIRST PAIR OF STEERS.

	$ c.
4,763 lbs. cut straw..................................	$
175 bush. turnips at 5c. per bush........................	8 75
1,322 lbs. wheat chop at $\frac{2}{3}$c. per lb......................	8 81
529 lbs. barley chop at $\frac{1}{2}$c. per lb........................	2 64
797 lbs. oat chop at $\frac{1}{2}$c. per lb..........................	3 98
	$ 24 18

SECOND PAIR OF STEERS.

	$ c.
6,080 lbs. cut straw..................................	$
1,596 lbs. wheat chop at $\frac{2}{3}$c. per lb....................	10 64
798 lbs. barley chop at $\frac{1}{2}$c. per lb........................	3 99
1,064 lbs. oat chop at $\frac{1}{2}$c. per lb........................	5 32
	$ 19 95

Summary of Results.	First Cost of Steers per Pair.	Value of Feed consumed per Pair.	Price sold for per Pair.	Profit per Pair.	Daily Gain of each Steer.
	$ c.	$ c.	$ c.	$ c.	lbs. oz.
First pair of steers, with turnips.........................	47 70	24 18	84 15	12 27	1 6
Second pair of steers, without turnips	47 20	19 95	86 70	19 55	1 6

It would appear from this experiment that at the prevailing prices for grain, turnips are fed at a loss. This, however, is contrary to the general experience of skilled feeders throughout the Dominion and further and more extensive experiments would be needed before such a conclusion could be accepted.

HOW TO MAINTAIN THE FLOW OF MILK DURING THE AUTUMN MONTHS.

Objections are sometimes made to this province as a dairy country on account of the early date in the fall at which the native pastures dry up.

In districts dependent solely on native grasses, the flow of milk lessens very materially after the first severe frost, as an instance of this, on the 3rd of September last we experienced 8 degrees of frost, this soon resulted in drying up the native grass and the flow of milk from the farm herd of four cows fell from 116 pounds on the 7th to 88 pounds on the 20th, or a gradual decrease of over 2 pounds each day.

On the 20th, the cattle were turned into summer-fallowed fields which had been partly sown with grain late in summer and in which there had also grown up more or less volunteer crop.

By the end of the first fortnight the decrease of 2 pounds per day had been turned into a slight increase, but the pasture on the fallow was thin and after the cattle had been on it for three weeks; the feed became short and the cows were herded on a field of Awnless Brome Grass of this spring's sowing; the grass was from six inches to a foot high, quite green, and fairly thick on the ground.

During the fortnight the cows were in this field, the flow of milk again increased, averaging 13 lbs. more per day than during the time they were fed on the green growth on the summer fallow. The brome grass was much thicker on the ground, and furnished more feed per acre, and was probably also more nourishing.

The brome grass was not nearly all fed off when winter set in, and it remained green until covered with snow.

This grass makes excellent pasture, and it would be well if every farmer keeping cows had a field of it into which he could turn his herd before the native pasture is ready in the spring, and after it is dried up in the autumn.

EXPERIMENTS WITH SWINE.

The piggery built in 1895 and described on page 304 of the annual report has answered the purpose fairly well, but the accommodations are only sufficient for two pure breeds of swine in addition to the feeding experiments necessary to be carried on, with crosses. The breeds kept at present are Tamworth and Berkshire.

WHEAT ALONE COMPARED WITH MIXED GRAIN FOR FATTENING SWINE.

Many farmers think that wheat alone is neither a safe nor economical feed for swine; to gain information on this point; six cross-bred pigs about 3 months old and all of one litter were divided into two groups as nearly equal, as possible.

In No. 1 pen the pigs were fed on ground wheat alone, soaked, the feed of those in No. 2 pen, was a mixture of ½ wheat, by weight ¼ barley, and ¼ oats all ground and soaked.

WEIGHTS.

Pen No. 1 wheat alone.

—	July.	Aug.	Sept.	Oct.	Nov.	Dec.		Lbs.
Weights	155	235	280	358	436	510	Gain	355

Pen No. 2 mixed grain.

—	July.	Aug.	Sept.	Oct.	Nov.	Dec.		Lbs.
Weight............	150	217	268	332	412	461	Gain	311

The three pigs in pen No. 1 consumed 1,606 pounds wheat, or 4½ pounds of wheat to produce 1 pound (live weight) of pork.

Those in pen No. 2 consumed 1,722 pounds mixed grain or 5½ pounds of grain to produce 1 pound of pork.

If the value of the manure be considered as an equivalent for the labour and attendance, pork at 4c. per pound live weight would make the wheat consumed in Pen No. 1 worth 88 cents per hundred pounds and in Pen No. 2 the mixed grain would be worth 72 cents per hundred pounds.

POULTRY.

The report on poultry is not as satisfactory this year as usual, a number of the young Plymouth Rocks were attacked with sore throats in December last, and this spread to the older fowls; a few only of the young Plymouth Rocks died, but the disease appeared to lessen the vitality of the laying stock, particularly that of the Plymouth Rocks and White Leghorns, the Black Minorcas were apparently free from this trouble. Several remedies were tried, the most successful being the injection in the mouth and nostrils of a mixture composed of equal parts of coal oil and sweet oil; a sewing machine oiler was found useful for this purpose.

On the approach of spring the disease disappeared, and no further deaths have occurred from this cause since. Many flocks in the neighbourhood were similarly attacked by this disease, and about the same time as the farm fowls; possibly the unusually damp weather may have had something to do with the appearance of the disease.

Reports are frequently received from parties who have been supplied in former years with eggs and fowls, the majority reporting successful results.

EGGS.

The following table gives the average number of eggs obtained each month from ten hens of each breed, when kept in confinement.

Name of Breed.	December, 1895.	January, 1896.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	Totals.
	Eggs.	Eggs.	Eggs.	Eggs.	Eggs.	Eggs.	Eggs.	Eggs.	Eggs.	Eggs.	Eggs.	Eggs.	Eggs.
10 B. Plymouth Rocks	14	32	38	31	105	118	72	82	76	89	57	13	727
10 White Leghorns	......	11	42	42	142	130	80	87	88	57	17	....	696
10 B. Minorcas	......	5	3	32	112	97	122	108	117	86	56	11	749

The following are the live weights reached this year by fowls of different ages and of different breeds:—

Name of Breed.	Age.	Weight.	
	Months.	Lbs.	Oz.
Barred Plymouth Rock, cock	18	10	7
" " cockerel	6	6	8
" " hen	18	7	..
" " pullet	6	6	10
Black Minorca, cock	18	6	8
" cockerel	6	5	8
" hen	18	4	8
" pullet	6	4	4
White Leghorn, hen	18	4	..
" Plymouth Rock pullet	6	5	2
Brown Leghorn hen	18	3	8

EXPERIMENTS WITH BEES.

On 1st June last two hives of Italian bees were received from Ontario, they were strong swarms and reached here in good condition.

To prevent loss from prevailing high winds, the stands were raised only three inches from the ground and placed under the protection of low growing trees.

Not having sufficient supplies of foundation comb, &c., in the early part of the season, the bees were crowded, and for that reason they were not managed to the best advantage, the yield was only 35 pounds from the two colonies, and under these conditions excessive swarming was encouraged, two swarms were obtained from each hive, one of which was very weak, but this swarm was successfully united with one of the others, leaving five colonies to be wintered.

The bees ceased working on account of cold in the last week of September, but at this date three of the colonies were well provided with stores, the other two were fed a few pounds of candied sugar, and all were placed in the cellar on the 10th October.

Notes were taken from time to time of the plants on which bees were found working to gain information regarding the available honey plants in this country. It was found that over fifty different kinds of flowers were visited by them during the summer.

EXPERIMENTS WITH FRUIT TREES AND SMALL FRUITS.

PYRUS BACCATA.

Pyrus Baccata is a wild crab from Siberia, which has been grown here successfully for five or six years, it is as hardy as our native trees and starts at the terminal bud each year. Last season several of the older trees growing on the farm were loaded with fruit, which although only about the size of an ordinary cherry, is a perfect apple in form and colour, and we trust that under the improving influences of cross-fertilization and selection this may form the basis of useful apples for Manitoba.

An orchard has been started comprising 108 young trees of .14 varieties of this wild crab of Siberia, all of which have been tested for at least one winter and found hardy. This orchard also contains 48 young seedlings of the yellow Siberian crab, raised here from seed sent from Ottawa.

Ground has been laid out and prepared for further orchard plots for the purpose of testing the crosses of Pyrus Baccata with some of the standard apples which have been made at the Central Experimental Farm.

CRAB APPLE TREES FROM MANITOBA SEED.

In several parts of the province, at an altitude of 800 to 900 feet above sea level, if protected by hills on the north and west, or heavy belts of timber, crab apples have borne fruit, the varieties being Transcendent, Hyslop, Whitney and Martha. As it is possible that the seed of this Manitoba grown fruit may develop hardier forms of trees, even at this altitude (1,231 feet), a quantity of the seed was procured from one of the growers, Mr. A. P. Stevenson, of Nelson, which has been packed in sand until the time arrives for planting next spring.

CHERRIES.

Five trees each of six varieties of seedling cherries were received from the Central Experimental Farm in the spring of 1895. These have survived one winter successfully, although some of them were slightly injured by frost. The seedlings of three of the varieties appear to be untouched by frost, while those of the other three sorts were more or less injured.

On the director's annual visit of inspection last August he found that among 200 trees of the Native Sand Cherry, there were six which showed sufficient desirable characteristics, in size and quality of fruit to justify their being named and propagated.

These bushes have been layered and the increase will be used for further planting or subsequent distribution. Following are the names and brief descriptions of these varieties arranged in the order of their apparent merit :

No. 9—Minnie—A vigorous and upright grower, fruit of good size and flavour.
No. 6—Brandon—Flavour good, prolific bearer.
No. 8—Othello—Very black, size large, flavour fair.
No. 5—Standard—Size large, slightly astringent.
No. 1—Progress—Astringent, prolific bearer.
No. 3—Challenge—Flavour fair, size medinm.

PLUMS.

A plantation was made of 200 native plum seedlings in the spring of 1896, which were raised from selected wild fruit.

The large trees which bore fruit last year again made a good show of both blossom and fruit, but the fruit in its early stage was badly affected by a fungus disease known as the plum pocket. To prevent the further spread of this disease all the affected fruit was collected and burnt, the extent of this injury varied from 15 to 75 per cent on different trees.

The following is a list of the imported plums now growing on the farm :—

Plums tested for 4 years and only partly winter killed, 3 Weaver, 4 De Soto, 15 Iowa seedlings ; both Weaver and De Soto bore a small amount of fruit this season, but both were late in maturing.

Plums tested for 2 years, 127 Weaver seedlings, 12 Cheney seedlings, 8 Speer seedlings, 6 De Sota seedlings, 5 Voronesh (102).

None of these have fruited, but all have made an excellent growth of well ripened wood.

In addition 86 unnamed seedlings from imported plums were set out in 1894, these are all living but have not made the same vigorous growth as the native seedlings.

Thirty-six varieties of improved native varieties were added to the plantation this year, procured from Charles Luedloff, Carver, Minnesota ; they were root grafts which were received in good condition and have become well established.

CURRANTS.

BLACK VARIETIES.

Since the year 1889, 22 varieties of black currants have been tested for one or more winters. Those which have succeeded best are given below with the average yield of 10 bushes for five years.

Variety.	When planted.	Average yield of 10 bushes for 5 years.	Remarks.
		Lbs.	
Lee's Prolific	1890	18	Flavour good, bushes healthy.
Black Naples	1890	14	" "
Champion	1890	12	Woody flavour, very vigorous.

SEEDLING BLACK CURRANTS.

Of these Climax still heads the list, it has only fruited for two seasons, but is of great promise. It stands the drought well, is a vigorous grower, productive and the quality of the fruit is excellent.

Parker fruited this year for the first time, the fruit of this is of medium size, flavour fair, ripens late with a vigorous growth of wood.

RED AND WHITE CURRANTS.

Of these 18 varieties have been tested to date, accompanying this will be found a list of the seven most promising kinds with the average yield of 10 bushes for five years.

Variety.	Average yield of ten bushes for 5 years.	When planted.	Remarks.
	Lbs.		
Raby Castle	16	1890	Small currant, large bunches.
Red Grape	15	1890	Very vigorous grower.
Fay's Prolific	15	1890	Fruit very large, small bunches.
Cherry	11	1890	Fruit large, growth not healthy.
Versailles	10	1890	Very healthy growth.
Victoria	7	1890	Shy bearer, healthy.
White Grape	16	1890	Healthy and prolific bearer.

NEW CURRANTS.

Thirty-one varieties of currants were received from the Central Experimental Farm last season, 22 of black, 7 of red and 2 of white, many of which are seedlings. They were all planted on uniform land where they will all have the same conditions, and will be reported on as they fruit.

TREE CURRANTS.

Six bushes were received from South Dakota in 1894, under the name of Missouri Tree Currant. This has the habit of the common yellow flowering currant (*Ribes aureum*) but the fruit is much larger. The bushes have fruited this year for the first time.

The fruit is large, ½ inch in diameter and of a deep purple colour varying in quality, some of them very pleasant to the taste. The bushes were well loaded with fruit which did not ripen until late in the season, the best of them will be propagated for further testing.

RASPBERRIES.

All varieties of raspberries bore well last season. Specimens of each sort had been laid down and covered with earth in the month of October of the previous year. After several methods for covering had been tried, this work was performed successfully in the following manner: one man grasps the young canes and with a firm and steady pressure bends them to the ground, a heavy furrow is at the same time turned out on the branches with a one horse plough kept far enough away from the bush to prevent injury to the roots. A light furrow is then thrown up on the other side of the row, by this plan

a large patch of raspberries is quickly laid down and the labour is more than repaid by the increased yield.

Thirty-eight varieties of raspberries and blackberries have been tested on this farm up to date. Of these fifteen have survived, the following are the most promising for cultivation in this province: Turner, Philadelphia, Sarah, Cuthbert, Golden Queen, Caroline and Hilborn Black Cap.

GOOSEBERRIES.

Twenty-four varieties of imported gooseberries have been tested, of these the Houghton and the Smith's Improved are the only ones that have been grown at all successfully and these when planted in exposed places have been more or less injured by frost each winter.

The five bushes of native sand-hill gooseberries mentioned on page 309 of last year's report have fruited this season. Unlike the fruit of the common native gooseberry it is about the size of the Houghton and of very fair flavour, and is perfectly hardy.

FOREST AND ORNAMENTAL TREES AND SHRUBS.

Seven hundred and eleven trees and shrubs of 86 species and varieties were received from the Central Experimental Farm in May last, they arrived here in fine condition, and were planted in one of the hedge inclosures. Most of these have not been tested before in Manitoba.

The season was an exceptionally good one for tree planting, 98 per cent of these have grown and many have become well established and have made a large growth. It is expected that many of these will prove useful and hardy.

SHRUBS AND TREES RECEIVED IN 1895 AND TESTED ONE YEAR.

Variety.	Number received.	Number alive at this date.	Remarks.
Acer Glabrum	50	15	Winter killed.
Spiræa Opulifolia	300	300	Hardy and ornamental.
" aurea	30	30	" "
Picea pungens	10	10	Hardy where protected.
Cornus Sibirica	30	0	The stock received were layers not well rooted.
Cotoneaster vulgaris	20	20	Hardy, fruited this season.
Cercidiphyllum japonicum	3	0	Winter killed, root and branch.
Pinus Cembra	5	3	Healthy, small growth.
Douglas Spruce	10	8	Hardy where protected by snow.
Rhamnus frangula	50	50	Hardy, large healthy growth.

GRAPES.

The Gibb and Bacchus grape vines which were planted in 1895 have lived through one winter, although covered with earth the Bacchus was badly killed back while the Gibb was apparently untouched.

Cuttings of Moore's Early grape were received from A. P. Stevenson of Nelson, Manitoba; some of these have struck and made fine plants, but have not yet been wintered.

The native Manitoba Grape vines planted last year have made rapid growth and are quite hardy.

EXPERIMENTS WITH POPLAR CUTTINGS.

It has been found by previous experiments that with Poplars, spring procured cuttings gave the best results.

Further tests have been made during the past season to gain information regarding the vitality of different parts of the tree, for which purpose one hundred cuttings of each of the following were taken.

1st. Last season's growth of wood cut with a heel, the terminal bud also left on.

2nd. Old wood about one inch in diameter, and,

3rd. Cuttings from the roots, 3 inches long.

Russian Poplar (P. Bereolensis) and Cottonwood (P. monilifera), were the trees selected for this experiment.

The results are shown in the annexed table.

Variety.	When planted.	Description of variety.	Percentage growing.	Remarks.
Russian Poplar..........	Spring.. ...	Last season's growth of wood, with heel and terminal bud..	92	Very thrifty.
"	"	Old wood 1 inch in diameter...	42	Fairly healthy.
"	"	Root cuttings..........	22	Not "
Cottonwoods............	"	Last season's growth of wood, with heel and terminal bud..	85	Very healthy.
"	"	Old wood 1 inch in diameter...	31	Healthy.
"	"	Root cuttings.................	10	Weakly.

A comparsion was also made between cuttings procured as soon as the snow had left in the spring and then buried top downwards until calloused, against cuttings procured just before the buds were bursting, and others were cut just after the bursting of the buds.

Variety.	How procured.	Percentage living.	Remarks.
Russian Poplar............	Cuttings taken early in the season and calloused before planting.	100	Very healthy, large growth.
"	Cuttings taken just before bursting of buds.	52	Healthy, small growth.
"	Cuttings taken just after bursting of buds.	15	Not healthy, very small growth.

AVENUES.

The avenues on this farm are now in a healthy condition ; 20 trees of the Box Elder (*Acer negundo*) were found to be dead last spring, these had been attacked the previous year by the Box Elder aphis (*Chaitophorus negundinis*), nearly all the trees which were killed had been planted on stiff gumbo soil, and not being as vigorous as those on better land, were the first to succumb to the attacks of the aphis. Although all the maple trees

on the avenues were more or less infested with this insect the previous year, no sign of this aphis has been seen this season, and the trees have made a healthy growth.

The spruce trees on the avenues were this year attacked by an aphis; the trees were well sprayed with kerosene emulsion, and no apparent injury was done.

ARBORETUM.

The arboretum surrounding the superintendent's house, started in 1893, has been added to each year, and now includes a large number of varieties of trees and shrubs. Specimens of 96 different sorts, nine of which were natives, were planted on these grounds during the year, making in all 176 varieties, a few of these appear to be only half hardy, but seem to be hardening up each year.

The new native trees were :

Buckthorn (*Rhamnus alnifolius*).

Willow-leaved Spirea (*Spiraea salicifolia*).

Five finger (*Potentilla fruticosa*).

Native oak (*Quercus macrocarpa*).

Dog-wood (*Cornus stolonifera*).

Native grape (*Vitis riparia*).

Balsam (*Abies balsamea*).

Red birch (*Betula borealis*).

Canadian shepherdia (*Sheperdia Canadensis*).

FOREST TREES.

The trees in the shelter belt have made a very vigorous growth this season, many of the deciduous sorts are 20 feet high and 5 inches in diameter, 1 foot from the ground.

Planting in this belt was commenced in 1889 and completed in 1891. It was kept cultivated with a one-horse "Planet Junior Cultivator" for the first six years, but in 1895 the trees had become dense enough to shade the ground, and it was only necessary to hoe it once by hand.

Last year the ground was shaded so well that the belt was kept free from harmful weeds by a few hours' work. This block has been remarkably free from the depredation of insect pests. It is invaluable as a barrier against the incursion of weeds which might otherwise blow in from the roads to the west of us, and makes also a good wind-break. This belt is an interesting object lesson to visiting farmers, and from this example many similar belts are being started throughout the province.

Many typical trees have been measured, and the average height and spread of branches are given in the following notes :—

BOX ELDER (*Acer negundo*).

This is a deservedly popular native tree both for avenue planting and as individual specimens. In the shelter belt it was the principal tree used as a nurse and protector for more tender varieties, and for this purpose was very suitable. It is a rapid grower and is one of the earliest trees in leaf in the spring. It bears its seeds in profusion, and is readily grown from seed. An average 8 year old tree was measured and found to be 19 feet high with a spread of branches of 14 feet, and the trunk 4 inches in diameter 1 foot from the ground.

MANITOBA WHITE ELM (*Ulmus americana*).

Another of the native trees well known here has done remarkably well in the belts, although not so rapid a grower as the Box Elder, it is to be prefered on account of its longevity and the larger size it attains. The knarled trunk of this tree reduces its value

for commercial purposes, but its large spread of branches will always make it a favourite as a shade tree.

Measurement of 8 year old tree, 14 feet high, 6 feet spread of branches, diameter $2\frac{1}{2}$ inches. Is readily propagated from seeds which are ripe the first week in June. Seedlings can also be transplanted from the woods where they are found growing in profusion around the parent trees.

CANOE BIRCH (*Betula papyracea*).

This tree is also indigenous here, many specimens have made a rapid and uniform growth, their silvery white outer bark and symmetrical habit makes them very conspicuous, the wood is also highly valued as a fuel. Average specimens 13 feet high, 5 feet spread of branches, 3 inches in diameter, age of tree 9 years.

EUROPEAN WHITE BIRCH (*Betula alba*).

This variety has made a rapid and bushy growth, and starts from the terminal bud each year ; it should be allowed to branch from the ground, for when it is pruned to a bare trunk it invariably sunscalds and eventually dies. Height 14 feet, spread of branches, 12 feet, diameter, 4 inches, age, 9 years.

RUSSIAN POPLAR (*Populus bereolensis*)

This seems to be the best of the many varieties of poplars imported from Russia and elsewhere which have been tested here, its large and luxuriant foliage and rapid growth make it a great favourite, and its habit of retaining its leaves after all other forest trees are bare, makes it valuable as a snow collector and wind break. It is readily propagated by means of cuttings either from the branches or roots. An average 8 year old tree was 19 feet high, with 12 feet spread of branch, trunk, $4\frac{1}{2}$ inches in diameter.

COTTONWOOD (*Populus monilifera*).

Fine specimens of this tree are found growing in the bluffs on the margins of the rivers in Manitoba. It is the quickest growing tree tested here, and a growth of 6 feet in a single season is not unusual. It is readily multiplied from spring made cuttings, and in this prairie province where rapid growing shelter belts are necessary, it is to be highly recommended. Height 21 feet, spread of branches, 12 feet 6 inches, diameter 5 inches, tree measured, 8 years old.

SHARP-LEAVED WILLOW (*Salix acutifolia.*)

A fine quick growing European variety. It is admirable as a hedge tree, is hardy and thrives well in the most exposed places, can be propagated quickly by either spring or fall cuttings, a tree 7 years old, grown in bush form, measured 16 feet high, with 18 feet spread of branches.

LAUREL-LEAVED WILLOW (*Salix laurifolia*).

Of all willows grown on this farm, this is the most admired, with its large shining leaves and graceful form. It grows readily from cuttings made in the spring.

Average 8 year old tree, height 9 feet, spread of branches, 9 feet, grown in bush form.

NATIVE WHITE SPRUCE (*Picea alba.*)

This is a beautiful native evergreen, which grows well on this farm, and as a wind break and snow collector, it is without a rival, it thrives well even in exposed places,

average 8 year old trees are 10 feet high, with 6 feet spread of branches It is difficult to propagate this tree from seed, but seedlings can be obtained in abundance in our native spruce woods.

SCOTCH PINE (*Pinus Sylvestris.*)

Although only a small percentage of the trees of this species have lived it is more than probable that drought rather than frost has been the cause of the large percentage of loss. Specimens now growing are doing remarkably well, one tree in the belt planted in 1890 measures 12 feet high, with 5 feet spread of branches and the trunk has a diameter of 4 inches, 1 foot from the ground.

FOREST TREES AND SHRUBS SUITABLE FOR MANITOBA.

Numerous inquiries are received for a list of trees and shrubs hardy and suitable for this climate ; to meet this demand such a list is appended with dates of planting and other particulars.

LIST of Forest trees and ornamental shrubs which have undergone at least two years' test and can be recommended as quite hardy and useful for general cultivation in this province :—

Name of Variety.	Date of planting.	Remarks.
Green Ash (*Fraxinus viridis*)	1889	Slow grower.
Black Ash (*F. sambucifolia*)	1891	"
Native Mountain Ash (*Pyrus Americana*)	1890	Vigorous.
Native Alder (*Alnus viridis*)	1894	Healthy.
White Birch (*Betula alba*)	1892	"
Cut-leaved weeping Birch (*Betula alba laciniata*)	1892	Vigorous growth.
Canoe Birch (*Betula papyracea*)	1889	"
Low Birch (*Betula pumila*) native	1894	Slow growth.
Northern Birch (*Betula borealis*) native	1893	Healthy.
Native Basswood (*Tilia Americana*)	1893	" growth.
Cottonwood (*Populus monilifera*)	1889	Large healthy growth.
Asiatic Poplar (*Populus certinensis*)	1889	Vigorous.
Russian Poplar (*Populus Bereolensis*)	1890	"
Populus Wobstii Riga	1889	Large healthy growth.
Siberian Poplar (*Pop Siberica*)	1889	Vigorous.
Native Aspen (*Populus tremuloides*)	1889	"
Populus Carolina	1890	"
Balsam Poplar (*P. balsamifera*)	1889	Large healthy growth.
Populus laurifolia	1894	Healthy.
" *nolesti*	1894	"
Native White Elm (*Ulmus Americana*)	1889	"
Box Elder (*Negunda aceroides*)	1889	Large healthy growth.
Ginnalian Maple (*Acer Ginnala*)	1890	Small "
Mossycup Oak (*Quercus macrocarpa*)	1889	Vigorous.
Native Sumac (*Rhus*)	1893	"
White Willow (*Salix alba*)	1889	"
Yellow Willow (*S— aurea*)	1890	"
Salix Voronesh	1889	Large growth.
Sharp-leaved Willow (*S— acutifolia*)	1889	"
Laurel-leaved Willow (*S laurifolia*)	1890	Healthy growth.
Fragile Willow (*S. fragilis*)	1889	Vigorous.
Salix Britzensis	1890	Small healthy growth.
Savin (*Juniperus Sabina*)	1891	" "
American Larch (*Larix Americana*)	1889	Healthy growth.
White Spruce, native (*Picea alba*)	1889	Vigorous.
Black " " (*Picea nigra*)	1894	"
Balsam Spruce (*Abies balsamea*)	1893	Slow healthy growth.

ORNAMENTAL SHRUBS.

Name of variety.	Date of planting.	Remarks.
Artemisia (A. abrotanum Var Tobolskianum)	1889	Rapid growth, ornamental.
" English (A. abrotanum)	1892	Very healthy "
Cut-leaved Artemisia (A. laciniata)	1894	" "
June-berry (Amelanchier)	1890	Fairly healthy "
Native Saskatoon (A. alnifolius)	1889	Very " "
Siberian Pea Tree (Caragana arborescens)	1889	Vigorous grower "
Caragana grandiflora	1890	" "
" Redousky	1890	Small growth "
" Mollis-glabra	1890	Vigorous growth "
" Rydmer	1890	Small growth "
" Frutescens	1890	" "
" Pygmaea	1891	Very small growth "
" Pubescens pendula	1890	Vigorous " "
Cotoneaster vulgaris	1894	Healthy, ornamental.
Native Hawthorn	1890	" "
Siberian Dogwood, (Cornus Sibirica)	1890	" "
Native " (C. stolonifera)	1891	" "
Buffalo Berry (Sheperdia argentea)	1890	Vigorous "
Common Lilac (Syringa vulgaris)	1889	Healthy, flowering shrub.
White Lilac (" " alba)	1889	" " "
Syringa de Marley	1890	" " "
Purple Lilac (S. purpurea)	1891	" " "
Hungarian Lilac (Syringa Josikea)	1892	Vigorous " "
Tartarian Honeysuckle (Lonicera Tatarica)	1891	Very healthy " "
Lonicera gracilis	1891	Healthy " "
" Alberti	1893	Fairly healthy "
" glauca (Native)	1891	Very " " "
Matrimony Vine (Lycium Europeum)	1891	Very healthy climber.
Japan Rose (Rosa rugosa)	1889	Vigorous flowering shrub.
Red-leaved Rose (Rosa rubrifolia)	1894	" " "
Flowering Currant (Ribes aureum)	1889	" " "
Mountain Currant (Ribes alpinum)	1889	Fairly healthy " "
Spiræa Opulifolia	1889	Very " " "
" " aurea	1891	Fairly " " "
Maywreath (Spiræa hypericifolia)	1890	Very " " "
Douglas Spiræa (S. Douglasii)	1889	Small growth " "
Spiræa billardi	1890	Fairly healthy " "
Willow-leaved spiræa (Native)	1893	Very " " "
Snow-berry (Symphoricarpus)	1894	Healthy " " "
Snowball Viburnum opulus sterilis	1890	Healthy, flowering shrub.
" lantana	1890	Vigorous " "
" rugosa	1894	Small healthy growth "
Cranberry Viburnum opulus	1890	Healthy, fruit and flowers.
Virginia creeper native	1890	Large healthy growth, climber.

SHRUBS.

The clumps of shrubs growing in the arboretum are a source of great interest to the visiting public.

Specimens of each variety have been plainly labelled in this plantation instructive for visitors. Notes were taken during the past season, on their habits of growth, hardiness, means of propagation, and also the date when in bloom, a partial list with notes is here given.

SPIRÆA HYPERICIFOLIA.

In full bloom on May 6th, this is one of the earliest flowering shrubs, it is a native of Canada but not indigenous to this province, it has a beautiful white blossom, blossoms freely and is readily reproduced by layering.

GUELDER-ROSE LEAVED SPIRÆA (*Spiræa opulifolia.*)

This shrub is easily propagated either from seed or layers, and is a very rapid grower, and free bloomer. It flowers during the first week of June, and the bloom is

followed by bunches of seed vessels which remain on until winter, it retains its leaves until late in the season.

Specimens six years old planted in the open valley are now six feet high with a spread of branches of eight feet.

SPIRÆA OPULIFOLIA AUREA, is another form of this shrub, its beauty chiefly lies in its golden leaf, it has not flowered here yet, and seems slightly susceptible to frost.

SPIRÆA BILLARDI.

A pretty little shrub, and a free bloomer. The flowers are of a pinkish white colour, it comes into full flower about the 6th of June, and continues to send out occasional flower spikes until frost comes.

COMMON MEADOW SWEET (*Spiræa salicifolia.*)

A small native shrub, which is found growing plentifully on our prairies. It improves under cultivation and is useful for hedges or as an ornamental shrub. A succession of flowers can be obtained by clipping the branches back after the first flowers have faded. This begins to bloom about the 26th June, height two feet.

SPIRÆA CALLOSA ROSEA.

A pretty little shrub in full bloom about the 24th July.

COMMON LILAC (*Syringa vulgaris.*)

These were in bloom May 30th, and were much admired with their masses of showy blossom and fragrant odour.

It is to be regretted that the late spring frosts often injure the flower buds here so that they fail to open. Seed has been saved this year from the later free blooming trees, and it is hoped that seedlings raised from these may give varieties which will escape frost by blooming later.

WHITE LILAC (*Syringa vulgaris alba.*)

This isnot as free a bloomer as that last mentioned; the flowers are pure white. The lilacs all retain their foliage until very late in the season, and for this reason they are more valuable in the shrubbery and are good snow collectors. In bloom on 4th June.

SYRINGA JOSIKEA.

This is another variety of the lilac from Hungary. Although not as beautiful in blossom as the common species, it is very suitable for this province, on account of its late flowering habit. The flower buds do not open until danger of frost is past. This was in full bloom about June 16.

TARTARIAN BUSH HONEYSUCKLE (*Lonicera tatarica.*)

This is a bush honeysuckle from Siberia, a very free blooming shrub, the small flowers almost hiding the foliage when in full bloom. It flowers early and abundantly each year, and is at the height of its bloom about the first week in June.

Its beauty is prolonged until harvest by its handsome red fruit. It is thoroughly hardy, starting to grow from its terminal buds each spring. The measurement of a six year old specimen is 9 feet high, with a spread of branches of 5 feet.

SIBERIAN PEA TREE (*Caragana arborescens*)

This was in full bloom 26th May. This shrub is from Siberia. It is very hardy and attractive in the spring with its delicate green foliage and yellow pea-shaped blossoms. It is easily raised from seed and should be on every farm in Manitoba. Seven year old specimens measure 10 feet high with spread of branches of 8 feet, growing in bush form.

WEEPING PEA TREE (*Caragana arborescens pendula*).

Is a dwarf weeping form, but is more floriferous than the former, it is particularly suitable for cemetery planting. Several other varieties of caragana have been tried here with success. They all bear their seeds in pods, from which they are easily grown.

CYTISUS CAPITATUS.

This is a beautiful little shrub with yellow pea-shaped flowers. To grow it with success it should be laid down and covered with earth, under these conditions the last season's leaves remain intact until the following spring. It flowers about the end of May, six year old tree, 3 feet high, spread of bush 3 feet.

YELLOW FLOWERING CURRANT (*Ribes aureum*).

This is well and favourably known in the eastern provinces and in Europe. It is a very free bloomer, flowering about the 27th May, and remains in flower for two or three weeks. It is readily propagated by suckers or cuttings, two year old wood is found to be the best for cuttings, height 6 feet.

MOUNTAIN FLOWERING CURRANT (*Ribes alpinum*).

This is a small compact shrub with a pretty foliage, but insignificant flowers, blooms about June 5.

BERRIED PYRUS (*Pyrus baccata aurantiaca*).

This is a small tree, shrub-like in habit, which is quite ornamental, bearing its clusters of white blossoms about the end of May, this has been already referred to under fruit.

GUELDER ROSE (*Viburnum opulus sterilis*).

This is a sterile form of the high bush cranberry, its large clusters of unfertile white flowers are much admired. It can be reproduced and propagated from layers or cuttings, and is in full bloom on 12th July.

SHRUBBY CINQUEFOIL (*Potentilla fruticosa*).

This is a pretty little native shrub, not as well known as it should be, which grows from one to three feet high, and is covered with blooms almost continuously throughout the season. The flowers are yellow. It is appropriately called cinquefoil or five-finger, from the shape of its leaf, which, when opened out has the shape of a human hand.

ROSA RUGOSA.

A very pretty single rose from Japan, some of which are red, and others white. There is also a semi-double variety, all of which are quite hardy here. Its handsome foliage makes it a very desirable acquisition. Another pleasing feature is the scarlet fruit which succeeds the flower. It grows 3 feet high and is in bloom about July 12th.

ROSA RUBRIFOLIA.

This is another perfectly hardy rose, but the flowers are small and less attractive. The deep purple colour of its leaves, however, makes it an object of interest. In bloom about July 15th.

GOLDEN-LEAVED ELDER (*Sanbucus nigra aurea*).

This, like all the elders thus far tested here, is killed almost to the ground every year, but on account of its beautiful golden foliage and rapid growth from the roots, it is valuable as a shrub. In bloom about June 25th. The flowers are succeeded by pretty bunches of berries.

SIBERIAN DOGWOOD (*Cornus Sibirica*)

The beauty of this shrub lies chiefly in the vivid red colour of its bark, which, contrasting in the winter months, when devoid of leaves, with the white snow, produces a very pretty effect. In bloom on July 16th; flower inconspicuous.

VARIEGATED-LEAVED DOGWOOD (*Cornus Sibirica variegata.*)

This is a form of the above, but has a very pretty variegated foliage; it is not as robust or hardy as the common dogwood, but is more desirable.

NATIVE DOGWOOD (*Cornus stolonifera*).

An attractive native shrub, growing in ravines and damp places, which flourishes well under cultivation. Flowers freely in white clusters, which are succeeded by bunches of white berries. In bloom 20th June.

GINNALIAN MAPLE (*Acer Ginnala.*)

A small shrub like maple from Asia, whose beauty lies chiefly in its foliage, has the true maple leaf, which turns from a brownish green to a deep red in the fall.

It is useful for low hedges or lawn planting. It flowers about June 20th, and its seed hangs on the tree during the winter. Propagated from seed.

HYDRANGEA PANICULATA GRANDIFLORA.

This showy shrub with its large panicles of white sterile flowers is very beautiful. Its late flowering habit makes it valuable as a succession to the earlier flowering sorts. Coming into bloom early in August, it continues in flower until frost comes.

BOX ELDER TREE SEED.

A large number of applications for tree seeds were received during the year, but owing to the complete failure of the crop in 1895, none could be had for distribution.

The crop of seed was a large one this year and 800 pounds was gathered from the trees planted on this farm in 1890–91, these will be available for distribution during the coming year. They are sent out in bags by mail containing about one pound each.

FOREST TREE DISTRIBUTION.

This branch of the work is very much appreciated by settlers living in the open prairie parts of the province. The number of packages sent out last season was larger than in any previous year, viz.: 777 packages containing from 50 to 100 trees or cuttings in each package, judging from the reports received, an intelligent interest in tree culture is increasing rapidly among farmers; the reports this year showing that a much larger number than usual have succeeded with the trees.

ANALYSIS OF TREE REPORTS.

Number of packages sent out	777
do reports received	405
Number reported as having received the parcels in good condition	345
do do do fair do	1
do do do bad do	22
do as having had good success with the trees	388
do do fair do do	13
do do poor do do	4

The following table shows the varieties receiving favourable notice in the reports, also the average growth made by them during the season.

Variety.	Favourably Mentioned.	Average Growth
	Times.	Inches.
Artemisia Abrotanum	101	44
Box Elder or Ash Leaf Maple	87	24
Caragana	84	27
Russian Poplar	76	45
Willows	69	11
American Elm	58	17
Voronesh Willow	49	40
Sharp-leaved Willow	41	36
Cottonwood	38	41
Green Ash	20	13
Lilac	14	12

THE VEGETABLE GARDEN.

The season of 1896 has been exceptionally favourable for the vegetable garden, both yield and quality being far above the average. Copious showers throughout the summer contributed largely to this result, coupled with the absence of spring frosts. The tests this year were conducted on slightly different lines to those followed out in previous years, and were confined to the more thorough testing of a few kinds, all the varieties of each that could be easily procured, being sown. The following were those selected for the test; onions, cauliflower, lettuce, savory herbs and garden turnips, and the results furnish information as to the suitability of varieties for our climate which it is hoped will be valuable. A few remarks on the mode of cultivation adopted for the vegetable garden, may not be out of place. The land is well manured in the fall, (care being taken to use only such manure as is thoroughly rotted), ploughed very deeply, thoroughly harrowed and finally rolled. In the spring a good, firm seed bed is ready, which is so essential to the successful growing of vegetables in this province. Spring ploughing has not proved a success here, its great fault being a tendency to dry out. Weeds are never allowed to make much headway and are kept down by occasional cultivation, and it is surprising to note how small an amount of labour is required in this direction if the weeds are destroyed from the start. Either a hand hoe or hand cultivator is used which, besides destroying the weeds, makes a fine light mulch, which greatly tends to conserve the moisture. I would call special attention to the hand cultivator. It is a very cheap tool, and any one purchasing one, will be amply repaid by the much larger amount of work done, as well as the superior manner in which it is accomplished. Another point in the preparation of the vegetable garden, is the necessity for clearing the land from all vegetable refuse in the fall. When this is done there is less danger from insect pests.

ONIONS.

Twenty-four varieties of onions were sown outside, on April 27, in rows 14 inches apart, and were thinned on June 15th. All germinated well with three exceptions, viz.: Southport Red Globe, White Tripoli and Yellow Rocca. Of the pickling varieties Small White Nocera gave the largest percentage of small bulbs, closely followed by White Barletta, the former yielding 60 per cent, and the latter 50 per cent. Of the larger varieties, I would recommend the following for general growing in this province, the points taken into consideration being:—1st, earliness of ripening; 2nd, clean appearance, and 3rd, productiveness.

Yellow Globe Danvers.—This variety has been well and favourably known here for years, and continues to give general satisfaction, as a main-crop onion for Manitoba. As its name implies, it is a globular, yellow variety, the skin is clean and bright, and it is a good keeper and shipper. We thoroughly recommend this variety.

Extra Early Flat Red.—This is the earliest ripening onion tested this year, and should certainly be included among the names of useful onions for Manitoba. It is a medium-sized flat variety, an abundant producer, and of good appearance.

Michigan Yellow Globe.—A variety very similar to Yellow Globe Danvers. It is however, of deeper colour, more spherical, and a heavier yielder, a first-class variety.

Southport White Globe.—The only one of the large silver-skin onions considered worth growing here. It is an abundant yielder, producing uniform, regular, globular bulbs, fine-grained and of mild flavour, and is entirely free from the soft loose skin of the other white varieties, which is so detrimental to their good keeping.

Prize Taker.—Although not so early in ripening as some of the former varieties, yet on account of its productiveness and fine appearance, this variety is worth a trial. It is a globular onion of a rich orange yellow colour, and a good keeper.

James' Keeping.—This is an entirely new variety here, and was received from Germany. Although not a large onion, its firmness deserves special mention and gives promise of being the best keeper yet tested. It is a globular variety of a pale yellow colour. The other varieties are excluded from special mention, either on account of their non-keeping appearance, or being too late in ripening. It would no doubt be useful to test them another year. Following is a tabular list of the tested varieties.

The yields are computed from one row 66 feet long.

Name of Variety.	Date Pulled.	Date Ripened.	Colour.	Shape.	Yield per Acre. Bush.	Yield per Acre. Lbs.
Michigan Yellow Globe	Aug. 31	Sept. 8	Yellow	Globular	410	
Red Victoria	Sept. 8	" 15	Red	"	428	16
Yellow Globe Danvers	Aug. 31	" 8	Yellow	"	405	20
Southport Red Globe	Did not germinate sufficient for test.					
White Tripoli						
Yellow Rocca						
Large Red Globe	Aug. 31	Sept. 12	Deep red	Globular	571	
Yellow Flat Danvers	" 31	" 8	Yellow	Flat	369	15
White Queen	Sept. 1	" 10	White	"	315	
The Oregon	Aug. 31	" 12	Yellow	"	425	18
Mammoth Silver King	Sept. 8	" 15	White	"	320	
Red Wethersfield	Aug. 31	" 12	Deep red	"	586	20
Southport White Globe	Sept. 1	" 10	White	Globular	473	15
Prize Taker	" 5	" 10	Yellow	"	590	17
Mammoth Pompeii	" 10	" 15	"	"	452	24
Red Tripoli	" 8	" 20	Red	"	366	19
Southport Yellow Globe	" 1	" 12	Yellow	"	454	
White Portugal	" 1	" 15	White	"	315	17
Extra Early Flat Red	Aug. 31	" 5	Red	Flat	396	40
Rose Monster	Sept. 8	" 15	Light pink	Globular	660	17
Small White Silverskin	" 12	" 15	White	Flat	210	29
White Barletta	" 10	" 15	"	"	251	30
Small White Nocera	" 10	" 15	"	"	218	45
James' Keeping	" 3	" 10	Yellow	Globular	313	17

LETTUCE.

Thirty-eight varieties of this vegetable were sown outside on May 5th, in rows 18 inches apart. They were thinned on June 12th, and were ready for use on July 4th, thus making a very thorough varietal test. As was expected, there was a great deal of resemblance between some of the varieties, but, notwithstanding, the test was a very useful and interesting one, and brought to our notice some good kinds not generally

grown, besides showing the adaptability of our soil, to this most refreshing vegetable. One variety, "Early Tennis Ball," did not germinate, and another, "Longstander Bronze Head," showed very poor vitality. Following will be found arranged in tabular form, the full result of this test, together with a few notes on the more meritorious varieties.

All Heart.—This, as in former years, upheld its reputation as an extra good variety. Very thin leaved, close in texture, and having a large, well blanched heart, which is cool, crisp and juicy.

Rennie's Nonpariel.—A thin-leaved cabbage variety, of good flavour and appearance, well curled and blanched, cool, crisp and juicy; a good variety.

Tilton's White Star.—A well-curled cabbage lettuce, with a peculiar whitish green appearance, makes a good heart, and is of excellent flavour.

Standard Yellow.—A large curled lettuce with well-bleached heart, very crisp and sweet; should be a standard variety.

Toronto Gem.—One of the largest varieties tested, of excellent flavour and appearance; would make a fine market sort.

Ohio Cabbage.—A well-curled cabbage variety, with a large, well-bleached heart and fine flavour.

I would make a special reference to the different varieties of "Cos" lettuce. These are not very well known here, and, when grown, the mode of bringing them to perfection for the table is not practised. Our attention is often drawn to complaints regarding this "green" lettuce, (as it is termed), and the Cos varieties, when not blanched, are most assuredly green and tough, and also very bitter. But if, after the plants have attained their maximum growth, the tops are tied closely together, at the end of 7 to 10 days after this operation, the most delicious lettuce is obtained, far exceeding the cabbage varieties in flavour and appearance for the table. I think if this fact is known this most desirable class of lettuce will be more generally grown, and in consequence more of this healthful vegetable eaten. There was no appreciable difference in the Cos varieties tested this year, with the exception that the leaves of Early White Self Folding Cos were more incurved than the others, making the blanching process easier.

Name of Variety.	Flavour.	Texture.	Weight per dozen.	Date went to seed.	Remarks.
Summer Cabbage	Fair	Firm	$1\frac{1}{4}$ lbs.	Aug. 10	Seed ripened.
Denver Market	Good	"	13 ounces.	" 10	
California Cream	Fair	Loose	10 "	" 10	
Tilton's White Star	Good	Firm	10 "	" 13	
Silver Ball	Fair	Loose	12 "	" 8	
Rennie's Nonpareil	Good	Firm	$1\frac{1}{4}$ lbs.	" 13	Seed ripened.
Early Hanson	"	"	14 ounces.	" 13	"
Philadelphia Butter	Fair	Loose	12 "	" 5	"
Ohio Cabbage	Good	Firm	14 "	" 12	
Grand Rapids	Fair	"	14 "	" 10	Seed ripened.
Red Edge Victoria	Good	"	12 "	" 12	"
Malta Drumhead	Fair	"	$1\frac{1}{4}$ lbs.	" 7	"
Early Curled Silesian	Good	"	1 lb	" 10	"
Royal Summer Cabbage	Fair	Loose	10 ounces.	" 5	
Nonpareil Cabbage	"	"	10 "	" 5	Seed ripened.
The Deacon	"	"	8 "	" 5	
Black Seeded Simpson	"	Firm	$1\frac{1}{4}$ lbs.	" 6	
Toronto Gem	Good	"	$1\frac{1}{2}$ do	" 10	Seed ripened.
Longstander Bronze Head	"	"	$1\frac{1}{2}$ do	" 8	
All Year Round	"	"	1 lb	" 5	Seed ripened.
Early Prize Head	Poor	Loose	8 "	" 3	
Early Curled Simpson	"	"	10 "	" 3	Seed ripened.
Early Tennis Ball					
Big Boston	Fair	Loose	16 ounces	" 5	Seed ripened.
All Heart	Good	Firm	16 "	" 10	"
Wheeler's Tom Thumb	Poor	"	6 "	" 20	
Buttercup	"	Loose	8 "	" 5	

LETTUCE, Test of Varieties—*Concluded.*

Name of Variety.	Flavour.	Texture.	Weight per dozen.	Date went to seed.	Remarks.
Nonesuch	Poor	Loose	8 ounces.	Aug. 5	Seed ripened.
Wonderful	Fair	Firm	10 "	" 6	"
Standard Yellow	Good	"	1¼ lbs.	" 6	"
Lorenz's Favourite	"	"	14 ounces.	" 10	"
Fearnought	"	"	15 "	" 5	"
White Paris Cos	"	"	1½ lbs.	" 15	"
American Curled	Poor	Loose	10 ounces.	" 4	
Early White Self Folding Cos	Good	Firm	16 "	" 20	
Green Cos	Very good	"	16 "	" 20	
White Cos	"	"	1¼ lbs.	" 20	Seed ripened.
Paris White Cos	"	"	1½ lbs.	" 20	

CAULIFLOWER.

Fifteen varieties of this vegetable were tested this season. All were sown in hotbeds in boxes on April 22nd, transplanted into spent hotbed on April 29th, and planted out on May 21st. All produced heads, although one of the varieties was too late in heading for this province. As soon as the heads commence to form, the leaves should be drawn around them and tied at the top, thus protecting them from the hot sun and dust, and retaining that snowy whiteness, which is indispensable to the ready sale of this vegetable. Following are a few notes on some of the varieties that specially commended themselves to our notice, also the full results of the test in tabular form.

Early Snowball.—As usual this was one of the best varieties grown. It is a sure header, and produces fine symmetrical heads, very close grained, and of a very white colour. It has also the merit of earliness.

Snowstorm.---Another good early variety, with very white compact heads. We would recommend this variety for general purposes.

Giant White Pearl—Fine grained, compact heads, of average weight and good colour.

Extra Early Whitehead.—An early variety with close grained heads of good colour and flavour.

Large Algiers.—Although off colour, this was worth growing as a late variety.

The other varieties tested were of ordinary merit with the exception of Autumn Giant, which seems too late for us. Probably it would do better if sown earlier.

Name of Variety.	First Headed.	Colour.	Texture.	Weight.
Early Snowball	July 15	Good.	Close	6 lbs.
Walcheren	Aug. 5	Poor	Loose	5½ "
Best of all	July 15	Good	Fairly close	8¾ "
Extra Early Paris	" 20	"	" "	6½ "
King of the Earlies	" 20	"	" "	6½ "
Large Algiers	Aug. 25	Poor	" "	7 "
Short Stem Le Normand	" 3	Fair	Loose	3¾ "
Earliest Dwf. Erfurt	July 8	Good	Fairly close	6¼ "
Half Early Paris	" 20	Fair	Close	5½ "
Giant White Pearl	" 15	Good	Very close	5½ "
Early London	" 20	Poor	Fairly close	3½ "
Extra Large Erfurt	" 25	Fair	" "	6¾ "
Extra Early Whitehead	" 20	Good	Close	5¾ "
Snowstorm	" 12	"	"	6 "
Autumn Giant	Sept. 11	Poor	Fairly close	6½ "

TURNIPS.

Fifteen varieties of garden turnips were sown with hand-drill, in rows 30 inches apart, on 15th May, all germinated well and were thinned on June 8th. In the fall some of the earlier varieties were attacked by one of the "Blister beetles" a noticeable feature in connection with this, was the fact, that the later varieties although sown side by side, were not affected, with this pest, which quickly stripped the leaves from the infested plants. As the varieties attacked, were past their eating stage it did not materially affect the value of the test. Following are the results in tabular form.

Name of Variety.	Ready for use.	Shape.	Colour.	Average weight.	Flavour.
				Lbs.	
Early White Six Weeks...	July 10.	Globular.....	White skin and flesh	$2\frac{8}{16}$	Fair.
Early White Flat Dutch ..	" 15.	Flattish	Red top, white flesh	$1\frac{10}{16}$	Strong and hot.
Jersey or Vertus..........	Aug. 1.	Long, tapering	White skin and flesh	$2\frac{4}{16}$	Poor and woody.
Extra Early Milan.......	July 1.	Flattish	Red top, white flesh...	$2\frac{4}{16}$	Fair when young.
Sweet German............	Aug. 6.	Swede shaped.	Green top, yellowish flesh	2	Fairly sweet.
Early White Stone........	July 10.	Flattish	White skin and flesh ...	3	Sweet but woody.
Orange Jelly	Aug. 6.	Globular.....	Yellow skin and flesh....	$1\frac{4}{16}$	Hot and tough.
Breadstone	" 1.	"	Green top, white flesh...	3	Sweet and juicy.
Waite's Eclipse...........	" 6.	"	Pink top, white flesh	$2\frac{4}{16}$	"
Red Top Strap Leaf	July 12.	Flattish	Red top, white flesh.....	$1\frac{8}{16}$	"
Seven Top...............	Aug. 6.	Long, tapering	White skin and flesh ...	$1\frac{9}{16}$	Sweet but woody.
Purple Top White Globe ..	July 15.	Swede shaped.	Pink top, white flesh	$4\frac{12}{16}$	Fairly sweet.
Large Amber Globe.......	Aug. 3.	Globular	Green top, yellowish flesh	$2\frac{8}{16}$	"
Golden Stone............	July 20.	"	Flesh and skin yellowish.	$2\frac{4}{16}$	"
Large White Globe Strap Leaf....................	Aug. 6.	Roundish.....	White skin and flesh	$1\frac{12}{16}$	Sweet and juicy.

The poorest variety tested was "Seven Top." This made luxuriant top-growth, but very little root.

SAVORY HERBS.

Twenty-six varieties of herbs were sown outside in rows two feet apart, on May 11, and proved a very interesting test, visitors to the farm showing much appreciation of this portion of the vegetable garden. Specimens of each variety were fixed on one of our show-boards, and exhibited at the local exhibitions visited by us, much interest being shown in them, especially among the ladies. All varieties sown germinated well, with four exceptions, viz. :—Dandelion, Pennyroyal, Chammomile and Catnip. Those useful in their dried state, were dried and preserved for exhibition samples, and some varieties ripened a fine sample of seed. Of the well known herbs such as Sage, Savory, Thyme, etc., it is not necessary to make any comment, except that it seems a pity, that so much of these often-used herbs, has to be imported, when they can be grown so well here. Particular attention is called to some of the varieties not generally grown.

Borage.—A hardy annual used as a pot-herb, and for bee pasturage, the farm bees being occupied with it all the time it was in bloom. Does well here.

Balm.—A perennial herb, the leaves having a perfume similar to lemons and is used for making balm tea to allay fevers.

Saffron.—A hardy annual cultivated for its flowers, which are used in dyeing. It is also used to adulterate the European saffron which is the flower of "Crocus Sativus."

Dill.—An annual cultivated for its seed, which has an aromatic odour, and a warm pungent taste. Good for flatulence and colic in infants. Seed ripened early.

Horehound.—A perennial herb with a strong aromatic smell, and a bitter pungent taste. It is a tonic and enters largely into the composition of cough lozenges and syrups. Does well here.

Coriander.—A hardy annual cultivated for its seeds, which have an agreeable aromatic taste and are used in confectionery. Care should be taken to gather the seed, without bruising the stems and leaves, as when injured, they have a disagreeable odour, which they impart to the seed. Seed ripened well.

Hyssop.—A hardy perennial with an aromatic flavour, and warm pungent taste. It is a stimulant and expectorant. The flowering summits and leaves are the parts used.

Rue.—A hardy perennial with a peculiar smell. The leaves are so acrid as to blister the skin. It is a stimulant and anti-spasmodic, but must be used with caution as it is a powerful remedy.

Following is a list of the varieties grown.

Name of Variety.	Date in Flower.	Date Pulled.	Condition when Gathered and Stored.	Properties.
‡Rosemary	....	Sept. 8	Dried well	
Sweet Basil	July 30	Aug. 3	"	Flavouring.
Summer Savory	" 30	" 3	"	"
§Chamomile	....	....	....	
§Catnip	....	....	....	
Tansy	Aug. 31	Aug. 31	Dried well	Medicinal.
* Anise	" 1	Sept. 8	Seed did not ripen	
Thyme	" 31	" 10	Dried well	Flavouring.
§Pennyroyal	....	....	....	
†Saffron	Aug. 14	Sept. 10	Flowers dried well	Dyeing, etc.
Borage	July 10	" 1	Dried only fairly	Bee pasturage.
Hyssop	Aug. 2	Aug. 3	Dried well	Medicinal.
‡Balm	....	" 14	"	"
Pot. Marigold	July 8	Sept. 1	"	Flavouring.
‡Wormwood	....	Aug. 14	"	Medicinal.
‡Broad Leaved Sage	....	" 14	"	Flavouring.
§Dandelion	....	....	....	
* Dill	July 15	Sept. 7	Seed ripened	Medicinal.
*‡Caraway	....	" 8	Seed did not ripen	Flavouring.
‡Rue	....	Aug. 14	Dried well	Medicinal.
* Fennel	Aug. 25	Sept. 7	Seed did not ripen	Flavouring.
Horehound	" 13	Aug. 14	Dried well	Medicinal.
Pot. Marjoram	" 12	" 14	"	Flavouring.
* Coriander	July 10	Sept. 1	Seed ripened	"
Sweet Marjoram	Aug. 3	Aug. 3	Dried well	"

*Grown for their seed. †Grown for flowers. ‡Did not flower. §Did not germinate.

TOMATOES.

Only three varieties of tomatoes were tested this year, and all produced ripe fruit. They were sown in the boxes in hot-bed on April 22, transplanted into boxes on May 5, and planted outside on May 27. Earliest of All ranks first as regards earliness, producing ripe fruit on August 8. Early Ruby follows, with ripe fruit on August 12, and Lorenz's Forerunner on August 20. The annexed table shows that although Earliest of All was the first to ripen, yet before frost Early Ruby had given the largest weight of ripe fruit, from an equal number of plants, and was the most productive variety, and as Early Ruby is a much better fruit in appearance and flavour, it must be conceded first place. This bears out our previous experience, with these two varieties. Lorenz's Forerunner is a new German variety, and this is most probably the first time it has been tested in this province. It is much later than the former varieties, although the fruit is far superior in shape and flavour. Some of the seed was saved, and according to previous experience we expect to obtain earlier fruit from this

seed next season. Attention is again called to the beneficial results of severe pruning on tomatoes in this province. While other gardeners in the district, had not had a single specimen of ripe fruit, we were pulling them in large quantity ; and in our own experiments, plants not pruned, were 10 to 15 days behind the others in ripening fruit. Our method is summed up in a few words. "After the plants have become established remove all lateral growths, and continue doing so throughout the season." It is the leading shoots that give ripe fruit here, and to promote the rapid growth of these is the object for removing the lateral or side growths. Some of the leaves should be clipped off occasionally to allow free access of air. When we consider the high price that can be obtained for home grown tomatoes, it is surprising that our local growers do not adopt this plan, but it was gratifying to note the number of visitors who saw the practical results of this method last season, and who expressed surprise at seeing ripe fruit so much earlier than anywhere else. Doubtless the lesson has not been lost, and better results in tomato culture will soon follow. The following table shows the weight of fruit gathered from an equal number of plants of each of the three varieties tested together with the date harvested.

RIPE FRUIT.

Earliest of All.		Early Ruby.		Lorenz's Forerunner.	
Aug. 8	10 ounces	Aug. 12	8 ounces	Aug. 20	4 ounces.
" 16	54 "	" 16	44 "	" 24	48 "
" 20	6 "	" 24	256 "	" 29	32 "
" 24	208 "	" 29	128 "	Sept. 1	17 "
" 29	128 "	Sept. 1	64 "	" 3	56 "
Sept. 1	104 "	" 3	144 "		
" 3	56 "				
	566 ounces.		644 ounces.		157 ounces.

GREEN FRUIT.

Sept. 3	240 ounces	Sept. 3	272 ounces	Sept. 3	200 ounces.
Total Weight.	806 "		916 "		357 "

BEANS.

Nine varieties of beans were sown this year, and all did exceptionally well. The variety to which we desire to draw special attention, is the Navy Bean of commerce, tried this year for the first time. It was sown on 26th May, outside, in rows $2\frac{1}{2}$ feet apart, and was ready for use as a string bean on 30th July. By the 1st of September the pods were ripe, and a fine sample of seed was gathered. I think we may fairly expect this bean to ripen in any ordinary season, and as it invariably commands a good price, should be a paying crop. The pod is of a light green colour, slightly curved, about $3\frac{1}{2}$ inches in length, and contains on an average 5 beans. It is very productive and yielded at the rate of 90 bushels to the acre on a small plot. We would strongly advise farmers to try a small patch of this valuable variety.

ASPARAGUS.

Too much cannot be said of this very useful vegetable. One of the most delicious of the season, and also the earliest, it should be grown by every one, and no farmer's

garden is complete without it. It is, contrary to general opinion, very easy to grow from seed, and a bed 12 x 40 feet containing 75 to 100 plants, should give an abundant supply for an ordinary sized family. Plant in rich soil, and every year give a liberal top-dressing of manure, as much as possible of which should be dug into the bed in the spring. A liberal sowing of salt, just before growth starts, is also said to increase the yield. Following are a few notes on the varieties tested :—

Conover's Colossal.—An old standard sort, very productive and of good flavour.

Barr's Mammoth.—Similar to the above, except in point of productiveness, which is less than that of the former. The growths are slightly stronger.

Giant Argenteuil.—This is the best flavoured and most succulent of all tested, much lighter in colour than the preceding varieties.

Name of Variety.	Date Planted.	Date Ready.	Productiveness.	Flavour.	Allowed to Seed.
Conover's Colossal.... ...	Fall, 1892.....	April 30 ...	Very productive	Good.........	June 27
Barr's Mammoth............	" 1894.....	May 10......	Fairly "	Fair	" 27
Giant Argenteuil............	" 1894.....	May 10 ...	Very "	Very good....	" 27

A quantity of asparagus seed was gathered this year, and will be available for distribution in the spring.

ARTICHOKES (Jerusalem.)

These, as noted in last year's report, were sown in November, 1895, as they were planted rather deeply the previous year it was thought that the small yield was perhaps attributable to this and in 1895 the tubers were only covered from 4 to 5 inches. A liberal top-dressing of manure was then given, which was removed early in the spring. Only about 40 per cent came up, so that a fair yield could not be obtained. It would appear as if these were not likely to prove a success here, the chief reason for this, is, no doubt, the shortness of the season.

CORN.

Seven varieties were sown and all germinated well. The following ripened their seed :—Mitchell's Extra Early, Keith's Black, Pop-Corn and Cory. First of All ripened partially. It would be to the advantage of some of our local growers, to take note of the first variety mentioned. It can always be depended on to ripen, while many kinds grown do not even get into a fit condition for table use. The cob is about 6½ inches in length, of a good white colour, and fair flavour. Keith's Black seems to be an improved Squaw corn. It is a flint variety producing cobs about 7 inches in length, of a bluish black colour, and although sown several days later than the others mentioned was one of the first to ripen.

Other vegetables not included in the preceding notes such as celery, cabbage, pease, radishes, beets, parsnips, carrots and citrons, etc., were all represented in the vegetable garden, by several good varieties and did very well. The celery was the best grown for years, and parsnips were also better than usual.

ANNUAL FLOWERS.

Forty-six varieties of annuals were tested this year, and gave general satisfaction, the flower garden proving a source of admiration to the many persons who visited the farm. The hot-beds came through the rather cool spring, in good condition, and by planting time, we had a fine stock of strong, healthy plants ready for bedding. In connection with hot-bed management, special attention is called to what is technically termed

"pricking off," or, in other words, transplanting from the seed-boxes into other beds, or boxes in which the plants are set a further distance apart, and where they remain until ready for planting outside. A great many people leave the plants too long, in the seed boxes, and the consequence is that leggy, straggling plants are produced. The method we have found to be productive of the best results is to transplant as soon as the seedlings can be barely handled. This seems to reduce the chances of a check to a minimum as they rarely ever flag or wilt, and strong stocky plants are produced. Varieties tried for the first time were :

Coreopsis Japonica.—Produces small yellow, composite flowers, of no particular merit.

Aster Liliput.—This is a very dwarf type of miniature asters. The flowers are early and are produced in profusion; a strain of asters which is well worth a trial.

Aster Cannell's Eynsford Yellow. This is presumably the only yellow aster in cultivation. It was originated by Messrs Cannell and Son, Kent, England, a tall strong-growing quilled variety, flowering fairly early, and is of a distinct yellowish colour, a valuable acquisition to this showy class of annuals.

PERENNIAL FLOWERS.

Fifty-six varieties of Perennials were growing on this farm in the summer of 1896, forty-eight of which have proved to be hardy, each year adds some new varieties to the list, some of them very beautiful, and there seems every reason to believe that in a few years the Manitoba Experimental Farm will be able to show a very creditable list of hardy perennials, many farmers have not the time to grow annuals, while with very little trouble, any one may have clumps of Perennials, which on account of their beauty and permanency will well repay those who plant them.

RHUBARB.

The large plot devoted to this very useful plant continues to attract the attention of visitors, the immense leaves and stems and the general vigour of the plants are a surprise to many.

Appended will be found a table giving the yield of each variety for the past season with other particulars. Tottle's Improved continues to give the most satisfactory returns.

Variety.	When planted.	Fit for use.	Colour.	Quality.	Yield per plant.
					Lbs.
Tottle's Improved	1892	May 20	Light red	Tender	44
Giant	1893	" 27	Green	Very tender	22
Royal Albert	1893	" 30	Light red	Fair	21
Scarlet Nonpareil	1893	" 31	Light green	Tender	21
Strawberry	1893	" 26	Light red	Fair	20
Johnston's St. Martin (seedling of)	1892	" 24	Red	Tender	19
Brabant's Colossal	1893	" 28	Green	"	19
Prince Albert	"	" 30	Light red	"	18
Myatt's Linnaeus (seedling of)	1892	" 24	Spotted	"	18
Early Crimson	1893	" 27	Light red	"	17
Victoria Seedling	1892	" 24	Red	"	16
Marshall's Royal Linnaeus	1893	" 29	Spotted	"	16
Scott's Mammoth (seedling of)	1892	" 24	Green	Poor, hard	15
Magnum Bonum	1893	" 29	Light red	Tender	14
Tobolsk	1893	" 30	"	Very tender	14
Paragon	1893	" 30	Green	Fair	10
Early Prince	1893	" 29	Dark red	Very tender	6
General Taylor	1893	July 1	Green	Hard	6
Salt's Perfection	1893	" 2	Light red	Tender	3

FORCING RHUBARB.

This plant was successfully forced last winter in a very simple manner.

Three small 2 year old roots were dug before winter set in, and stored in the cellar. On 1st December they were placed in a flour barrel and covered with clean sand, the barrel was placed near the furnace and the sand kept moist.

On 2nd January the first crop ($1\frac{1}{2}$ pounds) was pulled; the stalks were 15 inches long and very tender, cooking a bright red colour and good flavour; successive pullings were made each week up to 10th February, when the roots were exhausted. The total yield from the three roots was 15 pounds 10 ounces.

By this plan any person having a furnace in the house and a few rhubarb roots can grow sufficient of this healthy vegetable to supply a family for a portion of the winter.

DISTRIBUTION OF SEED GRAIN AND POTATOES.

The distribution of seed grain was much larger this year than in any previous one.

Circular forms were sent to each person supplied with grain and the replies especially from those to whom 2 bushel lots were sold were generally very satisfactory.

The following brief extracts are taken from some of the replies.

RED FIFE WHEAT.

G. H. Underhill, Rapid City, "yielded 50 bushels per acre, 10 bushels per acre better than my own Red Fife, will sow no other next year."

G. M. Greig, Rapid City "gave a larger head than the rest of my crop."

Wm. Evans, Brandon, "yield 42 bushels per acre, sample superior to my own."

J. Adamson, Gladstone, "the sample was far superior to the ordinary Red Fife."

BANNER OATS.

J. S. Scott, Lippentot, "the best I ever had."

Wm. West, Brandon, "threshers said they were the best oats threshed this year."

Wm. Chalmers, Hayfield, "rather earlier and yielded five bushels more per acre."

R. Allonby, Arrow River, "ripened earlier and yielded 8 bushels per acre more than other sorts."

G. H. Underhill, Rapid City, "yield 104 bushels per acre, 64 bushels per acre more than my black oats and 10 days earlier, will sow no other, sold all my surplus for seed."

W. R. F. Collis, Shoal Lake, "gave 73 bushels per acre, 13 bushels more than Black Tartarian, will sow only Banner in future."

Col. Irvine, Stony Mountain Penitentiary, "earlier and yielded 8 bushels per acre more than other oats."

J. Vickery, Wheatland, "gave 62 bushels per acre, are a very productive oat."

ODESSA BARLEY.

Wm. Stevens, Virden, "yielded 14 bushels more than my own two-rowed barley, and was much earlier, with better straw and stands hot weather better."

B. Little, Oak Lake, "ripens earlier and better weight."

Jas. B. King, Fairfax, "yielded 5 bushels per acre more than common barley."

Peter James, Rapid City, "2 weeks earlier and a heavier crop."

J. Adamson, Gladstone, "ripened earlier, grain was plumper."

Col. Irvine, Stony Mountain Penitentiary, "ripened earlier and the grain was heavier."

Chas. Guppy, Rosewood, "heavier than the old varieties, will answer well for this locality."

The following quantities were sent to applicants from this farm in spring.

	Lots.
Wheat 2 bushels or more	35
Oats " " "	76
Barley " " "	39
Pease " " "	16
Grain of all kinds in 3-lb. bags	348

DISTRIBUTION OF POTATOES, ETC.

Potatoes in 2-lb. bags	94
Rhubarb roots	32
" seed	30 pkgs.
Asparagus roots	16 "

HOPS.

The Kentish Golden and Native Manitoba hops mentioned in my last report survived the winter and made a growth of from 15 to 20 feet during the season; the foliage of the Kentish Golden is much darker than the native, and the flowers somewhat larger.

The native hop yielded an average of 8 pounds 5 ounces per hill of green hops, while the Kentish Golden gave a return of only 3 pounds 5 ounces per hill.

TILE DRAINS.

During the past season the tile drains have been subjected to a very severe test. A thaw in March started the drains to run freely. This was followed by a sharp frost early in April, which continued for three weeks, freezing the shallower drains solid. This delayed their working for a time after spring opened, but when once started they worked well and soon cleared the land of all surplus water.

Although the rainfall of the year was above the average, all under-drained parts of the farm were kept quite clear of surface water, and it is evident that tile-draining on low spots of land can be made a success here.

FARMERS' MEETINGS.

The interest at farmers' meetings was well kept up during the year, and the attendance has been above the average. These meetings afford an opportunity of explaining the work of the Experimental Farms to the most progressive farmers of the country, and the discussions often bring out suggestions of new lines of work which it is desirable should be undertaken at the Experimental Farm.

Since my last report, meetings at the following places were attended :—

December 13th, 1895. Wawanesa.
" 21st, 1895, Portage la Prairie.
February 6th, 1896, Oak Lake.
" 7th, 1896, Virden, two meetings.
" 8th, 1896, Elkhorn.
" 17th, 1896, Kildonan.
" 17th, 1896, Birds' Hill.
" 18th, 1896, Dairy Convention at Winnipeg.
" 19th, 1896, Stock Breeders' Meeting at Winnipeg.
" 21st, 1896, Rosser.
" 29th, 1896, Brandon.
March 14th, 1896, Rapid City.
" 18th, 1896, Melita.
" 19th, 1896, Napinka.
" 20th, 1896, Hartney.

AGRICULTURAL EXHIBITIONS ATTENDED.

An extensive exhibit of the products of the Experimental Farm was made at the Brandon Summer Fair last July; several excursion trains were run during the exhibition, and the attendance was much larger than usual.

Products of the farm were also exhibited at local agricultural fairs held at Virden and Souris.

ACKNOWLEDGMENTS.

I beg to acknowledge with thanks the following donations received during the year:—

J. D. Johnson, Ebor, Man., new variety of pease.
The Massey Manufacturing Co., Australian seeds.
R. W. Smith, Lake Dauphin, native grass seeds.
W. Sykes, Hilton, Man., wild red currant.
E. Fowler, Headingly, Man., vegetable seeds.
J. Beverage, Pilot Mound, Man., tomato seed.
J. B. Lang, Oak Lake, Man., willows.
J. S. Chaster, Sydney, Man., potatoes.
W. & J. Wallace, Niverville, Man., barley.
Wm. Barclay, Gilbert Plains, Man., grass seeds.
S. C. Young, Fort William, Ont., mountain ash trees.
John O. Stewart, Fort Francis, Ont., trees and tree seed.
Thos. Howard, Corrigan, Whitemouth, clover and timothy seed.
J. Burrows, Lambeth, Ont., seed oats.
A. McPherson, St. Boniface, Man., tree seed.
A. P. Stevenson, Nelson, Man., fruit for seed.
Nelson Bedford, Glencross, Man., fruit for seed.
D. D. Fraser, Oak River, Man., astragalus seed.
Prof. N. E. Hansen, Brookings, S. Dakota, cherry seed.
J. A. McRae, Kerfoot, Man., seed oats.

METEOROLOGICAL RECORD.

Month.	Highest Temperature.	Lowest Temperature.	Total Rainfall	Depth of Snowfall.	Total Amount of Sunshine.
			Inches.	Inches.	Hrs. Mins.
1895.					
November	44° above zero on 16th...	23° below zero on 26th...	None...	$11\frac{1}{4}$	78 6
December	40° " " 13th...	24° " " 26th...	" ...	6	87 12
1896.					
January	33° " " 8th...	43° " " 4th...	" ...	$18\frac{1}{2}$	83 54
February	45° " " 26th...	30° " " 25th...	" ...	$3\frac{1}{2}$	130
March	47° " " 24th...	31° " " 12th...	" ...	16	186 42
April	77° " " 26th..	11° above " 2nd .	2·4	6	151 48
May	88° " " 11th...	31° " " 2nd ..	2·9	None.	180 54
June	85° " " 29th...	41° " " 12th...	3·7	"	229 54
July	89° " " 1st....	39° " " 22nd ..	2·9	"	276 54
August	85° " " 1st....	33° " " 17th...	2·4	"	276 48
September	83° " " 28th...	21° " " 19th...	·6	"	144 6
October	76° " " 2nd ..	4° " " 20th...	None...	4	125
Total, 1896....	....	....	14·9	$65\frac{1}{4}$	1,951 18
" 1895....	....	....	11·5	$14\frac{3}{4}$	1,474 30

CORRESPONDENCE.

The correspondence from this office was larger during the past year than at any time in the history of the farm, 2,715 letters having been received and 2,430 despatched, this is irrespective of 2,324 circulars sent out.

I have the honour to remain, sir,
Your obedient servant,

S. A. BEDFORD, *Superintendent.*

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF ANGUS MACKAY, SUPERINTENDENT.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.,
31st October, 1896.

To DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith to you, the ninth annual report of the operations on the Experimental Farm for the North-west Territories, at Indian Head, Assiniboia, during the year 1896.

I have much pleasure in reporting the season just past as very favourable in almost all parts of the Territories. In the territory of Assiniboia, for grain, roots and vegetables, the season has never been surpassed.

The winter of 1895-96 was exceptionally fine from a North-west standpoint; there were a few cold days, but no long periods of severe weather. The new year was ushered in by some severe days, which proved to be the coldest and stormiest of the whole winter. February and March were very fine months, with an occasional cold day.

Sleighing was good during the entire winter. While very little snow fell at any one time, there was sufficient to ensure good sleighing from November to March, and the benefits derived from this advantage were increased by the absence of drifting and extremely cold weather.

In Assiniboia the spring opened early, but severe weather set in after seeding had commenced and the work was delayed. Eventually the spring was a very late one; in fact the latest for the last fifteen years.

The winter was a favourable one for stock of all kinds. Cattle never before wintered so well, and horses, sheep, swine and poultry came through in good condition.

During the early summer months mosquitoes and flies were very numerous, and proved injurious to cattle in many parts of the Territories, but the abundance of feed on the prairies soon counteracted any bad effects occasioned by these insects.

The first seed was sown on the Experimental Farm on April 13th. Some grain was sown earlier, in this and other parts of the Territories, but both land and weather were unsuitable and very little could be sown prior to that date. Seeding was general on the 13th and 14th April, but on the morning of the 15th a snow storm raged over the Territories, delaying the work until May 1st, when seeding again became general and continued without further interruption until completed The grain, although late in being put in the ground, never came up so quickly or so evenly. Heavy rains in May and June, with an almost entire absence of high winds, caused a rapid growth, so much so that grain on summer fallows was beginning to lodge, when a dry period, accompanied by three very hot days early in July, stopped the rank growth and caused the grain to head. This eventually proved the salvation of the crop, which matured, excepting in a few districts, ahead of frosts and gave the North-west the best yield and sample it has had for some years.

In some few districts in the Territories, hail storms did more or less damage, but with this exception nothing occurred to mar the bright prospect until August 26th, when a slight frost visited some sections of the country, but did little or no damage except in small strips on low-lying lands.

Rye, fully matured, was harvested on the Experimental Farm on July 27th, and the barley harvest commenced on August 3rd, being the earliest dates on which harvesting has ever been done on the farm. The wheat harvest was general on the farm and throughout the country between the 20th and 25th, and continued without delay until finished. Threshing was soon well under way, and with one of the finest autumns ever experienced in the Territories, the work was quickly done.

The returns from almost all districts show that large yields of wheat have been secured. The sample is principally No. 1 Hard. Much of the oat crop on the other hand was light, caused, no doubt, by its being sown late, and in the majority of cases on stubble land with little or no preparation. Where sown on summer fallow the yield has been very satisfactory.

Considerable rust appeared on wheat and oat crops early in August but being confined to the leaves—except in a very few cases where the stalks were affected—the grain was not perceptibly injured.

Smut did very little harm the past season.

On the Experimental Farm crops of all kinds turned out extra well. Winds, which in other years caused considerable loss, were very mild last spring. The crops consequently grew quickly, and evenly and matured earlier than ever before.

Forty-one varieties of wheat were sown in comparative test and all the yields and samples, were satisfactory.

Thirty-seven varieties of barley were tested; all giving large returns and the samples were never before equalled on the farm.

Sixty-two varieties of oats were sown; all returning large crops and good samples. The Banner Oats were extra fine and are, without doubt, one of the best varieties grown on the farm. Twenty-six varieties of field pease, twelve of which were cross-bred varieties, were tested. All produced extra good yields and samples.

Bromus Inermis (Awnless Brome Grass) fully sustained its reputation of being the best grass for the Territories, by producing an excellent crop of fodder.

Corn, roots, vegetables and small fruits all gave good returns, while trees and shrubs made a most satisfactory growth.

EXPERIMENTS WITH SPRING WHEAT.

Results of early, medium and late sowings.

In this test Red Fife and Stanley wheats were used, both of which are beardless sorts. The soil was a clay loam, summer-fallowed in 1895; and the seed was sown by drill at the rate of 1½ bushels per acre. The plots measured one-tenth of an acre each.

The first plots were sown on April 13th, the earliest possible date. The second and fifth weeks seeding could not be done on account of snow covering the ground on April 20th and a heavy rain on May 11th. Five plots of each variety of wheat were sown between April 13th and May 25th.

Very little difference could be discerned at any time, in the plots sown on April 13th and 27th and May 4th. They matured one day apart and when threshed returned very nearly equal amounts of grain. The plots sown on May 18th and 25th were very much later in ripening, in fact, the latter plot was cut quite green on September 9th as it was certain that a severe frost was near at hand.

The plots of Stanley wheat matured from three to four days earlier than the Red Fife but, as will be seen in the accompanying particulars did not yield so well.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Length of Straw.	Length of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
					In.	In.	Lbs.	Bus.	Lbs.	Lbs.
Red Fife	$\frac{1}{10}$-acre	April 13	Aug. 26	135	39	3	5,020	41	20	$64\frac{1}{2}$
"	"	" 27	" 27	122	39	3	4,290	41	20	$64\frac{1}{2}$
"	"	May 4	" 27	115	39	3	4,880	41	10	$64\frac{1}{2}$
"	"	" 18	Sept. 9	104	42	3	3,770	39	10	
"	"	" 25	" 9	107	42	$2\frac{3}{4}$	4,430	39	20	
Stanley	"	April 13	Aug. 22	131	42	$3\frac{1}{4}$	3,180	36	30	63
"	"	" 27	" 24	119	42	$3\frac{1}{4}$	4,500	35	50	$64\frac{1}{2}$
"	"	May 4	" 26	114	39	$3\frac{1}{2}$	4,050	37	50	$63\frac{1}{2}$
"	"	" 18	Sept. 2	107	42	3	3,120	36	20	$63\frac{1}{4}$
"	"	" 25	" 7	105	39	3	2,480	29		$63\frac{1}{2}$

ACRE LOTS OF WHEAT.

Thirteen varieties of wheat were sown on 2nd May, on plots of one acre each, for test as to earliness and productiveness. The soil was clay loam. The land had been well fallowed the previous year, but some of the top soil had been blown off during the fall and winter.

One and one-half bushels of seed was sown on each acre, by drill, and the land was not harrowed before or after seeding.

Six varieties were beardless and seven bearded wheats.

Old Red River, White Fife, Wellman's Fife and White Russian produced especially fine samples.

Name of Variety.	Date of Ripening.	Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bus.	Lbs.	Lbs.
White Russian	Aug. 27	117	39	Weak	$3\frac{1}{2}$	Bald	3,180	40	38	$63\frac{1}{4}$
Stanley	" 24	114	40	Strong	3	"	4,200	39	30	63
Herisson Bearded	" 21	111	36	Weak	3	Bearded	4,420	38	3	$67\frac{1}{2}$
Emporium	" 26	116	39	Strong	$3\frac{1}{2}$	"	4,300	37	29	65
Huron	" 21	111	42	"	$3\frac{1}{2}$	"	3,160	36	36	$64\frac{1}{2}$
Old Red River	" 29	119	39	"	3	Bald	4,060	35	52	$64\frac{1}{2}$
Red Fern	" 26	116	42	"	3	Bearded	3,928	35	44	$64\frac{1}{4}$
Rio Grande	" 26	116	42	"	$3\frac{1}{2}$	"	3,650	34	7	64
Advance	" 21	111	39	"	$3\frac{1}{2}$	"	3,870	33	43	$64\frac{1}{4}$
Ladoga	" 24	114	39	"	$2\frac{3}{4}$	"	3,440	33	40	$62\frac{3}{4}$

Spring Wheat—Test of Varieties.

Forty-one varieties of spring wheat were sown by drill on $\frac{1}{10}$ acre plots. The soil was clay loam, the land summer-fallowed and the seed sown on all the plots the same day, 2nd May, in the proportion of $1\frac{1}{2}$ bushels per acre.

Name of Variety.	Date of Ripening.	Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bus.	Lbs.	Lbs.
Countess	Aug. 22..	112	42	Strong....	$2\frac{3}{4}$	Bearded..	4,110	46	50	66
Gehun	" 18..	108	30	"	3	" ..	3,340	46	20	66
Goose	" 26..	116	45	"	3	" ..	4,550	45	50	$66\frac{1}{2}$
Huron	" 24..	114	36	"	3	" ..	3,890	44	40	$64\frac{1}{2}$
Emporium	" 28..	118	42	"	$3\frac{3}{4}$	" ..	4,980	44	..	$65\frac{1}{4}$
Dufferin	" 24..	114	42	Weak	3	" ..	3,890	43	30	$64\frac{1}{2}$
Admiral	" 25..	115	42	Strong....	3	Bald	3,610	43	30	64
Red Fern	" 26..	116	42	"	3	Bearded..	4,560	43	30	65
Beaudry	" 24..	114	39	Very weak	$2\frac{1}{2}$	" ..	4,210	43	10	65
Rideau	" 24..	114	39	Weak	$2\frac{3}{4}$	Bald	3,410	43	10	$63\frac{1}{2}$
Progress	" 22..	112	42	Strong....	$2\frac{3}{4}$	"	3,680	43	10	$63\frac{3}{4}$
White Connell	" 28..	118	42	"	$3\frac{1}{2}$	"	4,920	43	..	65
Pringle's Champlain	" 26..	116	42	Weak	3	Bearded..	4,750	42	30	$64\frac{1}{2}$
Golden Drop	" 24..	114	42	Strong....	$2\frac{3}{4}$	Bald	3,850	42	..	65
Wellman's Fife	" 28..	118	42	"	3	"	4,440	42	..	64
Preston	" 20..	110	36	"	3	Bearded..	3,990	41	50	64
Red Fife	" 26..	116	42	"	3	Bald	3,840	41	20	$64\frac{1}{2}$
Blenheim	" 25..	115	42	"	3	Bearded..	3,500	41	10	64
Monarch	" 28..	118	39	"	3	Bald	4,630	41	10	$63\frac{3}{4}$
White Fife	" 28..	118	42	"	$3\frac{1}{2}$	"	4,690	41	..	$64\frac{3}{4}$
Alpha	" 24 .	114	42	"	3	Bearded..	3,840	40	50	$63\frac{1}{2}$
White Russian	" 25..	115	42	"	3	Bald	3,140	40	30	$63\frac{1}{4}$
Stanley	" 24..	114	42	"	3	"	4,370	40	30	64
Captor	" 25..	115	42	"	$2\frac{3}{4}$	"	3,540	40	20	$63\frac{3}{4}$
Percy	" 24..	114	42	"	3	"	4,190	40	10	$63\frac{1}{2}$
Crown	" 25.	115	39	"	$3\frac{1}{2}$	Bearded..	4,410	39	50	64
Beauty	" 24..	114	45	Weak	3	Bald	4,340	39	20	$62\frac{3}{4}$
Advance	" 24..	114	42	Strong....	$2\frac{3}{4}$	Bearded..	4,260	39	20	$63\frac{1}{2}$
Campbell's White Chaff	" 25..	115	42	"	$3\frac{1}{2}$	Bald	4,350	39	10	64
Ladoga	" 24 .	114	42	" ...	$2\frac{3}{4}$	Bearded..	3,870	39	10	$62\frac{1}{2}$
Rio Grande	" 26..	116	42	"	3	" ..	4,080	39	..	64
Old Red River	" 28..	118	39	"	3	Bald	4,470	38	50	$63\frac{3}{4}$
Dion's	" 26..	116	42	Weak	3	Bearded..	5,070	38	50	$64\frac{1}{4}$
Black Sea	" 24..	114	39	"	3	" ..	4,570	38	50	$63\frac{1}{4}$
Hungarian	" 26..	116	39	"	$2\frac{1}{2}$	" ..	3,810	38	30	63
Herisson Bearded	" 25..	115	36	"	$2\frac{3}{4}$	" ..	4,400	38	20	$66\frac{3}{4}$
Vernon	" 25..	115	42	"	3	" ..	3,870	37	30	$63\frac{1}{2}$
Colorado	" 24..	114	36	"	3	" ..	4,390	36	50	64
Mars	" 25..	115	42	"	$2\frac{1}{2}$	Bald	3,350	36	10	65
Dawn	" 18..	108	36	Strong....	3	"	3,470	36	..	65
Ottawa	" 28..	118	39	Weak	3	Bearded..	3,850	33	20	63

BLUESTONE AS A REMEDY FOR SMUT IN SPRING WHEAT.

In this test very smutty seed was used. In former tests it has been demonstrated that bluestone is a sure preventative of smut if the seed is at all fit for use. This year the seed used was totally worthless for sale, being the product of untreated seed sown for two years.

The result shows that seed may be so smutty that bluestone is not entirely effectual.

In the three plots (sown with the same seed) all had smut, although the untreated, both in counted heads and yield of threshed grain on the one-tenth acre, was very much more affected than the other two.

Besides the three smutty plots, a plot was sown with ordinary Red Fife seed, treated with the solution of bluestone used in other test, among which, when ripe, not one smutty head could be found. These tests were on $\frac{1}{10}$ acre plots, clay loam.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Good and Smutty Heads in 6 ft. Square.	
RED FIFE. *Very Smutty.*				In.	In.	Lbs.	Bush.	Lbs.	Lbs.	Good.	Smutty.
Sprinkled—1 lb. to 8 bushels	May 5	Aug. 29	116	42	3	4,950	37	30	$63\frac{1}{2}$	1,248	104
Dipped " "	" 5	" 29	116	42	3	3,660	37	40	64	1,251	21
Untreated	" 5	" 29	116	40	3	4,190	32	10	$61\frac{1}{2}$	1,184	268
Ordinary Seed.											
Sprinkled—1 lb. to 8 bushels	May 5	Aug. 29	116	42	3	......	41	36	....	No smut.	

WHEAT—Test of Sowing Seed at Different Depths.

Sown by drill, May 5th, on clay loam, summer-fallowed, $1\frac{1}{2}$ bushels per acre, in plots of $\frac{1}{10}$ acre each.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	
			In.		In.		Lbs.	Bus.	Lbs.
Red Fife—1 inch deep.....	Aug. 26..	113	40	Strong....	3	Bald	3,570	38	30
" 2 "	" 26..	113	40	"	3	"	3,720	39	15
" 3 "	" 26..	113	40	"	3	"	3,700	38	50

YIELDS and Average for past five years.

Name of Variety.	1892.		1893.		1894.		1895.		1896.		Average.	
	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.
*Red Fife—1 inch deep	....	....	....	....	....	....	....	....	38	30	....	....
" 2 "	27		41	20	15	20	45		39	15	33	35
" 3 "	22	30	37	10	18		37	30	38	50	30	48

* Not tested previous to 1896.

WHEAT—Test of sowing different quantities of seed per acre. Sown by drill, May 5th, on clay loam in plots of $\frac{1}{10}$ acre each.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre. Bus	Yield per Acre. Lbs
			Ins.		Ins.		Lbs.		
Red Fife, 1 bush. per acre.......	Aug. 28..	115	42	Strong.. .	3	Bald	3,650	38	30
" 1¼ "	" 28..	115	42	"	3	"	3,800	40	10
" 1½ "	" 28..	115	42	"	3	"	3,600	38	20

YIELDS and average for past five years.

Name of Variety.	1892.	1893.	1894.	1895.	1896.	Average.
Red Fife, 1 bush. per acre.....	35·50	28·20	14·30	35·50	38·30	30·30 bushels.
" 1¼ "	40·00	28·00	11·40	44·00	40·10	32·40 "
" 1½ "	39·40	26·30	13·20	42·20	38·20	32·2 "

WHEAT—Test of Press *vs.* Hoe-drill. Sown May 5th on clay loam, summer-fallowed 1½ bushels per acre, in plots of $\frac{1}{10}$ acre each.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre. Bus	Yield per Acre. Lbs	Weight per Bushel.
			Ins.		Ins.		Lbs.			
Red Fife, sown by press-drill......	Aug. 23..	110	42	Strong....	3	Bald ..	3,950	41	3	64¼
" " hoe-drill........	" 24..	111	42	"	3	" ..	3,930	40	40	64

Yields and Average for five years.

Name of Variety.	1892.	1893.	1894.	1895.	1896.	Average.
Red Fife, press-drill.....	30·20	38·20	18·40	45·00	41·3	34·40 bushels.
" hoe-drill......	24·00	36·18	17·50	44·00	40·40	32·33 "

As will be seen by above, the plots sown by press-drill have given the best returns in five years' trial.

FALLOW VS. STUBBLE LAND.

In this test eight acres of summer-fallow and eight acres of stubble land were used, a road dividing the two fields.

Both were sown by press drill and not harrowed before or after seeding. One and one half bushels seed was sown per acre. Soil, sandy loam. The stubble field was burnt over and was not ploughed before being sown.

Like all other stubble crops in the district this field gave a much better return than it promised early in the season, nine ordinary loads of sheaves being taken off the 8 acres, averaging a little more than 26·00 bushels grain per load. The field produced a crop of Red Fife wheat in 1895 and had been fallowed in 1894.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	
				Ins.		Ins.		Bush.	Lbs.
Red Fife—Fallow... ..	May 1.. ...	Aug. 25.....	116	42	Strong	3	Bald..	40	10
" —Stubble.......	" 5.....	" 22....,	109	39	"	3	" .	29	40

WHEAT—TEST OF CUTTING WHEAT ON GREEN SIDE.

Three one-tenth acre plots were measured and cut in a field of Red Fife wheat. One plot was cut on August 14, with the grain in the early milk state; the second plot on August 21, when the grain was in the dough condition, and the third on August 28, when the grain was ripe.

			Yield per acre.	Sample.
Red Fife—one-tenth acre cut	Agust	14....	30·30	Poor, 60 Lbs.
"	"	21....	38·20	Good, 63¾ "
"	"	28....	40·50	" 64½ "

Summary of results obtained in various tests made in the cultivation of wheat during the past season."

FIRST.

In the test of early, medium and late seeding, the earliest sown plots gave the best yield and sample; the medium a smaller yield and poorer sample and the late sown were not early enough to escape frost.

SECOND.

The test of fallow *vs.* stubble land gave the usual result, the fallow producing the better crop, and while a second crop can be obtained in this way from the same land without any expense for cultivation, it is apparent that land should be summer-fallowed, at least every second year.

THIRD.

The bluestone test this year shows that it is possible for seed to be so badly smutted that bluestone will not be entirely effectual as a remedy, but for ordinary seed it is a sure preventive of smut.

FOURTH.

In the test of sowing different quantities of seed per acre, the plot sown at rate of one and one-quarter bushels gave the largest yield, as has been the case in the tests carried on during the past five years.

FIFTH.

Seed sown two inches deep produced the largest returns. The results for the past five years being over three bushels per acre, on an average above the plots sown either shallower or deeper.

SIXTH.

Press-drill gave a slightly larger yield than the hoe-drill and the grain ripened one day earlier. In five years tests the press-drill has averaged over two bushels per acre better than the ordinary drill.

EXPERIMENTS WITH BARLEY.

This crop, the past year's, was exceptionally good ; the samples being the finest ever grown on the farm. Many of the two-rowed varieties weighed 54 pounds to the bushel. The majority of the small plots of barley were lodged and had to be cut one way, as was also the case with field and acre lots.

As there were no frosts or high winds after the barley was sown the crops sustained no check but grew from the start quickly and evenly, and matured without damage of any kind ; except in the case of the one-tenth acre plot sown on June 1st in test of early, medium and late seeding, which was green on September 9th when cut for fear of frost, and in consequence lost considerably in yield and sample.

Sown by drill, 2 bushels per acre on clay loam summer-fallowed, size of plots $\frac{1}{10}$th acre each.

BARLEY—Test of Early, Medium and Late Sowing.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Remarks.
				In.		In.		In.	Bus.	lbs.	Lbs	
Canadian Thorpe..	April 27	Aug. 14..	109	33	Weak	3	Two-row'd	3370	74	43	52¾	Lodged.
" ..	May 4	" 18..	106	33	" .	3	"	2820	75	..	52½	"
" ..	" 11	*	....	....	.....	...	....	....	....	....	..	
" ..	" 18	" 26..	100	36	Fair..	3	Two-row'd	4270	68	36	52¼	
" ..	" 25	Sept. 7..	105	36	" ..	3	"	4270	70	4	54	
" ..	June 1	" 9..	100	36	" ..	3	"	4630	61	15	52½	Green when cut
Odessa	April 27	Aug. 3..	98	30	Weak	3	Six-rowed.	3420	63	26	49¾	Lodged.
"	May 4	" 7..	95	33	" .	3½	"	3870	71	42	49½	"
"	" 11	*	....	....	.....	...	....	....	....	....	....	
"	" 18	" 14..	88	33	Fair..	3½	Six-rowed.	3820	65	30	50	
"	" 25	" 24..	91	33	" ..	3½	"	3920	67	34	50	
"	June 1	" 26..	86	33	" ..	3½	"	4020	62	24	51	

* Seeding omitted on account of rain.

BARLEY—Field lots.

Sown by drill at rate of 2 bushels per acre. All lodged badly and had to be cut one way.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	
	Acres.				In.		In.		Bus.	lbs.
Oderbruch	2	May 14..	Aug. 10..	88	36	Fair....	3	Six-rowed...	70	10
Prize Prolific	6½	" 14..	" 27..	105	36	Weak...	3½	Two-rowed..	67	..
Canadian Thorpe	3¾	" 14..	" 29..	107	36	Fair....	3½	" ..	63	..
Odessa................	9	" 9..	" 11..	94	38	Strong..	3	Six-rowed...	62	7
Goldthorpe........ ..	7	" 16..	Sept. 4..	111	33	Fair....	3	Two-rowed..	55	30
Duckbill	1¼	" 16..	Aug. 29..	105	30	"	3	" ..	55	15
California Prolific	½	" 16..	" 29..	105	36	"	3½	" ..	52	10

SIX-ROWED—Test of Varieties.

Nineteen varieties of six-rowed barley were sown by drill on plots of one-tenth acre each. The soil was clay loam, the land summer-fallowed and the seed sown on all the plots on May 16th in the proportion of 2 bushels per acre.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Mensury	Aug. 14..	90	33	Strong ...	4	2,970	71	42	50½
Common	" 10..	86	33	Fair	2½	3,820	68	36	52
Trooper	" 18.	94	30	Weak	3	2,910	67	14	51¾
Oderbruch	" 10.	86	33	"	3	2,790	65	10	52¼
Baxter's	" 18..	94	33	"	3	2,570	65		51¾
Odessa	" 11..	87	30	"	3	2,820	62	24	49¾
Royal	" 14..	90	30	" ..	2½	2,470	61	40	51¼
Rigid	" 8..	84	30	"	2½	2,470	60	20	51¾
Summit	" 17..	93	30	" ...	3	3,220	59	18	53
Petschora	" 10.	86	30	"	2½	2,520	58	16	49¼
Phœnix	" 7.	83	30	"	2	2,640	58		50¾
Stella	" 14..	90	30	" ...	3	2,400	55	30	50¾
Rennie's Improved	" 24..	100	36	"	2½	3,260	55	20	51½
Nugent	" 14..	90	30	Fair	2½	2,860	55	20	50
Vanguard	" 10..	86	30	Weak	3	2,170	55	10	49¾
Excelsior	" 10.	86	30	"	3	2,610	54	18	44¾
Champion	" 14..	90	36	Fair ...	3	2,460	53	16	46¾
Surprise	" 14.	90	30	"	2½	2,970	52	12	52
Success	" 3..	79	30	"	2½	2,370	50		46

TWO-ROWED—Test of Varieties.

Seventeen varieties of two-rowed barley were sown by drill on plots of one-tenth acre each. The soil was clay loam, the land summer-fallowed and the seed sown on all the plots the same day, 16th May, in the proportion of 2 bushels per acre.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bush.	Lbs.	Lbs.
French Chevalier	Aug. 25..	101	36	Strong....	3½	3,700	73	16	54½
Newton	" 25..	98	36	"	3½	3,620	68	36	53½
Beaver	" 22..	98	30	"	3	3,220	66	32	54½
Canadian Thorpe	" 26..	102	36	"	3½	4,700	65		53
California Prolific	" 24..	100	36	"	3½	3,850	63	46	53¾
Sidney	" 24..	100	36	Weak ...	3	3,600	61	42	54½
Danish Chevalier	" 24..	100	30	"	3½	2,220	61	22	54¼
Victor	" 24..	100	36	Strong ...	3½	3,720	60	40	53¾
Duckbill	" 24..	100	36	"	3	4,420	60	20	53
Monck	" 27..	103	36	"	3½	2,760	57	44	54
Nepean	" 24..	100	36	Fair	3½	2,780	57	24	53¼
Bolton	" 20..	96	24	Strong ...	3½	3,340	55	40	55¼
Carter's Prize Prolific	" 25..	101	30	"	3½	3,220	52	4	53½
Thanet	" 26..	102	33	Weak	3	3,090	50	30	52
Pacer	" 26..	102	30	Strong ...	3	3,280	46	2	52½
Black	" 22..	98	24	"	3	2,820	44	10	65½
Kinver Chevalier	" 25..	101	30	Weak ...	3	2,330	42	24	52¾

TEST OF REMEDIES FOR SMUT IN BARLEY.

Three plots were sown with rather smutty seed as follows :—

1st. Untreated.

2nd. Treated with bluestone solution, at the rate of one pound bluestone to eight bushels seed, and

3rd. Treated with potassium sulphide solution 1½ lbs. of potassium sulphide in 25 gal- of water, the seed being steeped in the solution for 24 hours.

As shown by the following tables the treatments used were almost entirely effectual, as no smut was found in six feet square of plot treated with potassium sulphide and only five heads in the same area of plot treated with bluestone ; while on the other hand, the untreated plot contained considerable smut and did not turn out as well when threshed as the other two.

The varieties of barley, sown in uniform test plots, were treated before seeding with bluestone and although the seed of a number was affected with smut, the product was almost entirely free from this disease.

Barley—Six-rowed, smut test.

Seed sown by drill 16th May, 2 bushels per acre on clay loam summer-fallowed size of plots one-tenth acre each.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per acre.		Weight per Bushel.	Good and smutty heads on 6 ft. square.	
Surprise—			In.		In.	Lbs.	Bush.	Lbs.	Lbs.	Good.	Smutty.
Untreated	Aug. 14	90	33	Fair.... ..	3	3,320	42	34	52	934	163
Bluestoned 1 lb. to 8 bush.	" 14	90	36	"	3	3,020	50		52½	1,160	5
Potass. sulphide.........	" 14	90	36	"	3	2,960	49	8	52	1,104	

RESULTS OBTAINED IN EXPERIMENTS WITH BARLEY.

1st. In the test of early, medium and late sowings of barley, the second week's sowing of each variety gave the best returns.

For the past five years, the sowings from 1st to 15th May, have given the largest yields, and there seems to be no doubt that the period between these dates is the best time for barley seeding. If sown earlier, the early frosts are liable to put the crop back, and if later, dry weather may set in and keep the grain from heading out properly. The results of these tests show clearly that June 1st is much too late to sow barley in this climate.

2nd. In the test of varieties, the six-rowed sorts have been much the earliest to mature, although the two-rowed have given the best yields and finest samples. Of the six-rowed varieties grown this year, Mensury produced the best yield and has the advantage of a strong straw. Of the two-rowed sorts, the French Chevalier gave the best returns. This variety in a field lot also gave a very large yield and a splendid sample.

On account of earliness, the six-rowed varieties appear to be the most suitable for the Territories and besides their early maturing qualities, they stand dry seasons better than the larger growing two-rowed sorts.

3rd. Treating barley with bluestone for smut, appeared to be effectual this year. With the exception of the untreated plot in the smut test, there was little or no smut in any of the varieties grown on the farm, although a good deal of the seed used was more or less affected.

EXPERIMENTS WITH OATS.

Sixty-three varieties of oats were tested the past season: all being grown on land which had been summer-fallowed in 1895. Ten of the varieties were cross-bred sorts received from the Central Farm. It will be noticed that the straw of these new oats was considerably longer than that of the older varieties.

Nearly all the varieties produced large returns and in every case the samples were very fine.

The Banner heads the list for productiveness; one field of twenty acres yielding 1,958 bushels, in addition to which there were two large loads not threshed.

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

Two varieties of milling oats were used for this test and sown by drill on fallow land. The soil was clay loam and the size of the plots was $\frac{1}{10}$th of an acre. The first plots were sown on 27th April and the last on 1st June; the third week's seeding being omitted on account of rain. The last plot sown of each variety, was cut on the green side on 9th September to escape heavy frost which was expected that night.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Banner	April 27..	Aug. 17..	112	42	Strong....	10	Branching	4,310	92	32	41¼
"	May 4..	" 18..	106	42	"	10	" ..	4,300	106	16	42½
"	" 18..	" 21..	95	42	"	10	" ..	4,310	94	14	40½
"	" 25..	Sept. 2..	100	42	"	10½	" ..	4,560	114	4	38¼
"	June 1..	" 9..	100	42	"	9½	" ..	3,710	79	24	40¼
Abundance	April 27..	Aug. 18..	113	45	" ...	10½	" ..	3,710	106	26	40
"	May 4..	" 19..	107	45	"	10	" ..	3,970	105	30	42¼
"	" 18..	" 21..	95	48	" ...	10	" ..	4,540	102	32	39¼
"	" 25..	Sept. 5..	103	48	"	10	" ..	4,080	94	24	41
"	June 1..	" 9..	100	48	"	9	" ..	3,920	80	30	39½

OATS—One Acre Plots.

Sown 6th May by drill at rate of 2½ bushels per acre; soil, clay loam, summer-fallowed.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Bavarian	Aug. 22..	108	48	Strong....	9½	Branching	4,090	98	15	40½
Flying Scotchman	" 13..	99	36	"	9½	" ..	4,100	90	3	44
Abundance.....	" 19..	105	45	"	10	" ..	3,300	88	22	42¾
Oderbruch................	" 21..	107	48	"	9½	Sided.....	4,530	77	4	42¼
Winter Grey..............	" 13..	99	42	"	8½	Branching	3,990	76	6	46
Black Tartarian...........	" 24..	110	48	Weak ...	9½	Sided.....	4,220	70	30	40¼
Golden Beauty........ .. .	" 15..	101	42	Strong....	10	Branching	3,200	70	15	43
American Beauty..........	" 18..	104	42	"	9½	" ..	2,680	67	2	43½
Abyssinia.........	" 20..	106	45	"	10	Sided.....	3,540	66	28	43¼
Wide awake	" 18..	104	36	"	9	Branching	2,760	64	6	43¼
Columbus.................	" 15..	101	33	"	9	" ..	3,050	63	10	41½
Improved Ligowo....... ..	" 13..	99	42	"	10½	" ..	3,020	61	20	43
Early Archangel.....	" 13..	99	36	"	10	" ..	2,870	61	..	44¾

NOTE.—The seven varieties last mentioned were sown on a dry part of the field which will account for the yields being considerably lower than those of the same varieties in "test of varieties," all sown same date and on similar soil.

OATS—Test of Varieties.

Sixty-two varieties were sown in this test, on fallow, by drill, at the rate of 2½ bushels per acre. The soil was clay loam of a uniform character; the plots were $\frac{1}{10}$th acre each, and they were all sown on the same day—5th May. They came up evenly, and made a good growth of straw, though none were very heavy. A few varieties were weak in the straw, and under the heavy load of grain became partially lodged.

The first varieties to ripen were White Wonder, Bonanza, Victoria Prize and Cream Egyptian.

In the following table will be found the results of this test in detail :—

Name of Variety.	Date of Ripening.	Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bus.	Lbs.	Lbs.
Holstein Prolific	Aug. 18..	105	42	Strong....	11	Branching	2,890	103	18	41½
American Triumph	" 19..	106	42	"	10½	" ..	4,100	97	22	41½
Improved American	" 19..	106	48	"	10	" ..	3,600	96	6	41½
Early Golden Prolific	" 18..	105	45	Weak	10	" ..	3,260	95	30	41
Doncaster Prize	" 19..	106	42	Strong....	10	" ..	5,680	95	10	39¾
Banner	" 18..	105	42	"	10	" ..	3,920	94	4	42
Improved Ligowo	" 9..	96	39	"	10	" ..	2,860	92	32	43
Early Maine	" 19..	106	33	"	11	" ..	4,430	92	12	40
White Monarch	" 19..	106	42	"	9½	" .	4,190	92	2	40¼
Bavarian	" 18.	105	42	"	9½	" ..	3,910	91	16	41¼
Cave	" 18..	105	39	Weak	10	Sided. ...	4,540	90	10	41¾
Wide awake	" 17..	104	42	Strong....	10½	Branching	3,210	90	..	42¾
American Beauty	" 17..	104	36	"	9½	" ..	2,770	89	24	43¼
Golden Beauty	" 19..	106	42	Weak ...	10	" ..	3,520	89	24	41½
Columbus	" 17..	104	42	"	9½	" .	4,250	89	24	39¼
Abundance	" 18..	105	42	Strong....	10½	" ..	3,390	89	14	39¾
Mennonite	" 19..	106	42	"	10	" ..	3,740	89	4	40¼
Finland Black, No. 1	" 24..	111	36	" ...	10½	" ..	3,920	88	..	43
Early Archangel	" 14..	101	42	" ...	10½	" ..	3,850	85	30	41½
Early Gothland	" 19..	106	42	"	10	Sided.....	4,420	85	10	44½
California Prolific Black	" 24..	111	48	"	10	"	3,940	84	24	41
White Schonen	" 18..	105	42	"	10	Branching	3,450	84	14	40¼
Wallis	" 18..	105	42	"	10½	" ..	3,500	84	14	40¾
Prolific Black Tartarian	" 24..	111	48	Weak	10	Sided.....	4,780	80	.	41¾
Early Etampes	" 24..	111	30	" ...	9½	Branching	4,100	79	14	39½
White Russian	" 14..	101	45	Strong....	9½	" ..	3,610	79	4	44¾
Early Blossom	" 26..	113	45	"	10	Sided.....	4,840	78	8	43¾
Joanette	" 24..	111	30	"	10	Branching	3,670	77	32	40¼
Bonanza	" 7..	94	39	"	10	" ..	3,020	77	22	44½
Hazlett's Seizure	" 17..	104	42	"	9	" ..	3,430	75	20	46
Abyssinian	" 24..	111	42	" ...	10½	Sided.....	3,830	75	10	43
Golden Giant	" 28..	115	48	"	9½	Branching	4,240	75	10	38¾
Challenge	" 7..	94	42	"	8	" ..	2,870	75	..	44¾
White Wonder	" 6..	93	42	"	8	" ..	2,730	73	8	44
Oderbruch	" 19..	106	45	"	10	Sided.....	4,280	72	22	44
Siberian	" 26..	113	42	"	9½	"	4,590	71	16	37
Coulommiers	" 28..	115	36	Weak	10	Branching	4,490	71	16	41½
Cream Egyptian	" 7..	94	39	Strong....	10	" ..	2,750	71	6	43½
Buckbee's Illinois	" 26..	113	48	"	8	" ..	3,390	70	50	40¾
Welcome	" 8..	95	42	"	9½	" ..	2,680	70	10	43¼
Victoria Prize	" 7..	94	33	"	10	" ..	2,790	70		43½
Prize Cluster	" 10..	97	42	"	9	" ..	2,570	67	2	44¾
Rennie's Prize	" 10..	97	45	" .. .	7½	" ..	3,200	66	26	45¼
Rosedale	" 22..	109	45	"	9½	Sided.....	4,300	66	16	44½
Winter Grey	" 10..	97	39	"	8	Branching	3,520	64	24	45½
Poland	" 10 .	97	42	"	10	" ..	3,590	64	4	47
Flying Scotchman	" 11..	98	42	"	9	" ..	3,130	62	32	41¾
Scotch Hopetoun	" 25..	112	42	"	8½	" ..	4,240	62	18	40¼
Lincoln	" 17..	104	42	Medium..	9½	" ..	4,190	62	2	43¼
Scottish Chief	" 11..	98	36	Strong....	9	" ..	3,100	60	10	41½
Imported Irish	" 10..	97	36	"	9	" ..	3,470	57	12	45[illegible]
Black Finland, No. 2	" 10..	97	36	"	9	" ..	2,540	56	16	39[illegible]

OATS—Cross-bred Varieties.

These were sown, 5th May, on clay loam, on plots of one-tenth of an acre each.

Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bus.	Lbs.	Lbs.
Olive— Black Tartarian....... Early Gothland......	Aug. 25	112	45	Strong....	.....	....	5,700	84	24	42½
King— Banner .... Doncaster Prize.....	" 26..	113	45	"	10	Branching	3,270	77	32	38¾
Pense— Black Tartarian....... Early Gothland.......	" 28..	115	48	"	...	....	4,080	71	6	42½
Oxford— Giant Cluster......... Prize Cluster.........	" 28..	115	48	"	......	....	3,870	68	18	40¼
Medal— Giant Cluster......... Prize Cluster.........	" 25..	112	45	"	8½	Branching	4,500	67	22	40¾
Brandon— Giant Cluster......... Prize Cluster....	" 25.	112	48	"	9	Sided.....	4,130	63	38	41¼
Russell— Prize Cluster....... Giant Cluster.........	" 27..	114	45	" ...	...	....	3,280	62	32	39¾
Master— Prize Cluster......... Giant Cluster.........	" 28..	115	48	" ...	...	....	3,990	62	2	39
Cromwell— Prize Cluster......... Giant Cluster.........	" 28..	115	48	"	......	....	3,960	61	16	39¾
Miller— Banner.............. Doncaster Prize......	" 24..	111	48	"	10	Branching	3,980	59	16	41½

OATS—Field Lots.

Sown by press drill on clay loam, fallowed, at rate of 2½ bushels of seed per acre.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Kind of Head.	Yield per Acre.		Weight per Bushel.
	Acres.				In.			Bus.	Lbs.	Lbs.
Banner	20	May 4.	Aug. 18..	106	48	Strong....	Branching	97	18	43
Hazlett's Seizure........	8	" 8..	" 17..	101	48	"	" ..	95	30	40¾
Bonanza ... ... : ...	2	" 7..	" 11..	96	46	"	" ..	Not threshed.		

OATS—Tests for the prevention of smut.

Experiments with bluestone and potassium sulphide for the prevention of smut.

Three plots of one-tenth acre each were sown in the above test; the soil was clay loam. The seed of the first plot was untreated; that of the second was treated with Bluestone at the rate of one pound to eight bushels of oats and that of the third with a solution of potassium sulphide. The seed used was smutty.

The plot untreated produced a considerable quantity of smut while in the other two scarcely any could be found. The plots treated on the other hand, took from four to six days longer to mature.

All the oats sown the past year, with the exception of the seed on the above mentioned plots were treated with Bluestone at the rate of one pound to eight bushels of seed, which treatment proved its efficacy by the almost entire absence of smut in either field or smaller plots of grain.

Treated with.	Date of Sowing.		Date of Ripening.		No of days Maturing.	Length of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Heads on six feet square.	
						Inches.	Inches.	Bush.	Lbs.	Lbs.	Good.	Smutty.
Potass. Sulphide...	May	5	Aug.	26	113	48	$10\frac{1}{2}$	72	10	$41\frac{1}{2}$	924	0
Bluestone.	"	5	"	28	115	48	$10\frac{1}{2}$	72		$41\frac{1}{3}$	878	5
Untreated..	"	5	"	22	109	46	$10\frac{1}{2}$	70	26	$41\frac{3}{4}$	804	120

RESULTS OF TESTS IN THE CULTIVATION OF OATS.

1st.—In the tests of early, medium and late seeding, the late sowings proved decidedly too late, as the two latest plots were quite green on September 9th, when they were cut for fear of frost, which would have caused a considerable loss in yield. The plot of Banner sown on May 25th gave the largest yield ever grown on the farm. From the one-tenth acre there were 388 pounds of clean grain, which is at the rate of $114\frac{4}{34}$ bushels per acre.

2nd.—In the test of varieties for earliness and productiveness, one variety exceeded 100 bushels per acre, eleven gave 90 bushels or over, thirteen gave 80 bushels or over, nineteen gave 70 bushels or over, fifteen produced 60 bushels or over, and three gave 50 bushels or over. In earliness, White Wonder matured in 93 days from the time of seeding and five other sorts matured in 94 days. Banner took 105 days or twelve days more than White Wonder.

3rd.—In the acre test of thirteen varieties, Bavarian, Flying Scotchman and Abundance, gave the largest yields of grain and straw. Black Tartarian also gave a large yield but the straw was very coarse and lodged badly. Seven of the varieties were sown on a high part of the field and they produced one-third less straw than the same varieties sown in one-tenth acre plots. For earliness and yield combined, Flying Scotchman was first in this test.

4th.—In the smut test, Bluestone proved almost entirely effectual as a preventive. All the seed oats were treated and smut did not affect this year any plot or variety sown.

5th.—So far as yield is concerned the best variety tested is the Banner. The straw is rather coarse, and the grain requires several more days to come to maturity than a number of others, but if sown on fallow land in reasonable time, it will mature safely, and give large returns every year.

EXPERIMENTS WITH PEASE.

For this crop the past season has been the most favourable since the establishment of the farm. In former years spring frosts and high winds have always injured the young plants, but this year they were entirely free from such injury, and the crop produced was an extra fine one.

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

Two varieties were sown in this test, on clay loam, in plots of one-tenth acre each. The first seeding was done on May 4th and the latest on June 1st, the seeding which should have been done on May 11th being omitted on account of rain.

The plot of Mummy sown on June 1st was not ripe when frost came, on September 9th and was badly frozen.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Character of Growth.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
					In.		Bush.	Lbs.	Lbs.
Golden Vine.............	May 4..	Aug. 22..	110	Strong....	$2\frac{1}{2}$	Small.....	47	..	$66\frac{1}{4}$
"	" 18..	" 28..	102	"	$2\frac{1}{2}$	"	46	50	$65\frac{1}{2}$
"	" 25..	Sept. 1..	99	"	$2\frac{1}{2}$	"	40	..	66
"	June 1..	" 8.	99	"	2	"	38	20	$65\frac{1}{4}$
Mummy..................	May 4..	Aug. 22..	110	" ...	$3\frac{3}{4}$	Large	39	40	66
"	" 18..	" 28..	102	"	$3\frac{3}{4}$	"	38	10	$65\frac{1}{2}$
"	" 25..	Sept. 2..	100	" ...	$3\frac{1}{2}$	"	34	15	$65\frac{1}{2}$
"	June 1..	" 9..	100	"	3	"	30	..	.. ....

PEASE.—Test of Varieties.

Twenty-six varieties were sown on clay loam 9th May, on fallow land, by drill at the rate of $2\frac{1}{2}$ bushels of small pease and 3 bushels of the larger sorts per acre. Twelve of the varieties were new cross-bred sorts, all of which gave satisfactory returns. Carleton, cross-bred, produced the largest yield of all the varieties sown; 170 pounds of cleaned pease from a one-twentieth acre plot.

In 1895 the varieties were badly mixed by winds after being pulled. This year the plots were allowed to become quite ripe, then pulled, drawn in and threshed at once.

Name of Variety.	Size of Plot.	Date of Ripening.	Number of days Maturing.	Character of Growth.	Size of Pea.	Yield per Acre.		Weight per Bushel.
	Acre.					Bush.	Lbs.	Lbs.
Multiplier....................	$\frac{1}{20}$	Aug. 26..	109	Strong......	Small	45		65
Centennial	$\frac{1}{10}$	" 28..	111	"	Large	40	30	65
Golden Vine.	$\frac{1}{10}$	" 21..	104	"	Small	40	20	66
Prince Albert..................	$\frac{1}{10}$	" 26..	109	"	"	40	10	$65\frac{3}{4}$
Crown	$\frac{1}{10}$	" 21..	104	"	"	40	3	$65\frac{3}{4}$
Prussian Blue..................	$\frac{1}{20}$	" 26..	109	"	Medium....	38	20	$66\frac{1}{4}$
Canadian Beauty............	$\frac{1}{10}$	" 26..	109	"	"	37	35	$63\frac{3}{4}$
Mummy........................	$\frac{1}{10}$	" 21..	104	"	Large	37	10	$65\frac{1}{2}$
Potter..........................	$\frac{1}{10}$	" 21 .	104	"	Medium....	33	20	66
Pride.	$\frac{1}{10}$	" 26..	109	"	"	33	20	$65\frac{1}{2}$
Large White Marrowfat........	$\frac{1}{20}$	Sept. 1..	115	"	Large	31	20	65
Creeper......	$\frac{1}{10}$	" 1..	115	"	Small	30	30	$65\frac{1}{2}$
New Potter............	$\frac{1}{10}$	Aug. 26 .	109	"	Large	28	20	$63\frac{3}{4}$
Black-eyed Marrowfat...... ...	$\frac{1}{20}$	" 26..	109	"	"	26	40	$63\frac{3}{4}$
Daniel O'Rourke................	$\frac{1}{20}$	" 24..	109	"	Small	25		$66\frac{1}{2}$

PEASE—Test of cross-bred varieties, all sown same day.

Name of Variety.	Size of Plot.	Date of Ripening.	Number of days Maturing.	Character of Growth.	Size of Pea.	Yield per Acre.		Weight per Bushel.
	Acre.					Bush.	Lbs.	Lbs.
Carleton	$\frac{1}{20}$	Sept. 1	115	Strong	Small	56	40	$64\frac{1}{2}$
Mackay	$\frac{1}{20}$	" 3	117	"	Medium	45		$64\frac{3}{4}$
Paragon	$\frac{1}{20}$	" 1	115	"	"	43	20	63
Duke	$\frac{1}{20}$	" 1	115	"	Large	43		64
Trilby	$\frac{1}{20}$	" 3	117	"	"	41	40	$65\frac{1}{4}$
Macoun	$\frac{1}{20}$	" 1	115	"	Small	40		$65\frac{1}{4}$
Agnes	$\frac{1}{20}$	" 2	116	"	Large	40		$64\frac{1}{2}$
Bedford	$\frac{1}{20}$	" 5	119	"	Small	38	20	$64\frac{1}{2}$
Prince	$\frac{1}{20}$	" 3	117	"	Large	36	40	$64\frac{3}{4}$
Kent	$\frac{1}{20}$	" 1	115	"	Medium	35		$64\frac{3}{4}$
Arthur	$\frac{1}{20}$	Aug. 24	109	"	"	34	40	67
Bruce	$\frac{1}{20}$	Sept. 3	117	"	"	28	20	65

COST OF GROWING GRAIN ON EXPERIMENTAL FARM.

With the view of ascertaining the cost of preparing land for grain, sowing the seed, harvesting and threshing, an account, commencing in 1895, has been kept of the expense in connection with the production of twenty acres of wheat on fallow-land ; eight acres of wheat on stubble-land ; twenty acres of barley on fallow-land and twenty acres of oats on fallow-land. The account does not include allowance for horses or their keep or wear and tear of implements used. The wages paid include board.

A comparison of the cost of production and the estimated value of product is also given. The value of oats and barley is, at present, not very high, to be on the safe side twenty-five cents per bushel is the price upon which the calculations are made.

No doubt, on large areas, wheat, oats and barley can be grown at somewhat less cost than on the few acres considered in this test, and if the farmers have the help within themselves, a large amount can be deducted from wage account. A farmer with from one to four hundred acres of wheat, can average more acres per day in seeding, cutting, stooking and stacking than can be done on this farm with twenty acre fields. Wheat is at present worth more per bushel than is allowed in the calculations made.

WHEAT—COST OF GROWING 20 ACRES ON SUMMER FALLOW.

1895—Ploughing once, 13 days work at $1.50	$ 19 50
Harrowing twice, 2 days work at $1.50	3 00
Cultivating once, 3 days works at $1.50	4 50
1896—Seed, 30 bush. at 50c	15 00
Sowing seed, 2 days work at $1.50	3 00
Cutting grain, 2 days work at $1.50	3 00
Twine, 60 lbs. at 10c	6 00
Stooking, 3 days work at $1.50	4 50
Stacking, 5 men, $1\frac{3}{4}$ days at 1.50	13 10
Threshing, (including board) at 5c	40 00
Total	$ 111 60

Cost per acre, $\$5\frac{58}{100}$.

Value of product (40 bushels per acre, 800 bushels wheat at 55c	440 00
Less cost of production	111 60
Leaving a net return of	$ 328 40

Or $\$16\frac{42}{100}$ per acre.

WHEAT—Cost of growing eight acres on stubble ground.

1896—Drawing straw and burning stubble, one day at $1.50	$ 1 50
Seed, 12 bushels at 50c	6 00
Sowing seed, $\frac{3}{4}$ day at $1.50	1 12
Cutting grain, $\frac{3}{4}$ day at $1.50	1 12
Twine, 20 lbs. at 10c	2 00
Stooking, $\frac{3}{4}$ day at $1.50	1 12
Stacking, 5 men $\frac{1}{2}$ day at $1.50	3 75
Threshing (including board) at 5c	11 90
Total	$ 28 51

Cost per acre, 3\frac{56}{100}$.

Value of product (29$\frac{3}{4}$ bushels per acre) 238 bushels wheat at 55c	$ 130 90
Less cost of production	28 51
Leaving a net return of	$ 102 39

Or 12\frac{79}{100}$ per acre.

BARLEY—Cost of growing twenty acres on fallow-land.

1895—Ploughing once, 13 days work at $1.50	$ 19 50
Harrowing once, 1 day's work at $1.50	1 50
Gang ploughing once, 5 days work at $1.50	7 50
1896—Seed, 40 bushels at 30c	12 00
Sowing seed, 2 days work at $1.50	3 00
*Cutting grain, 4 days work at $1.50	6 00
Twine, 80 lbs at 10c	8 00
Stooking, 3 days work at $1.50	4 50
Stacking, 5 men 2 days at $1.50	15 00
Threshing (including board of men)	49 50
Total	$ 126 50

Cost per acre, 6\frac{32}{100}$.

Value of product (67$\frac{1}{2}$ bushels per acre) 1,350 bushels at 25c	$ 337 50
Less cost of production	126 50
Leaving a net return of	$ 210 00

Or 10\frac{55}{100}$ per acre.

OATS.—Twenty acres on fallow-land.

1895—Ploughing once, 14 days work at $1.50	$ 21 00
Harrowing twice, 2 days work at $1.50	3 00
Cultivating once, 3 days work at $1.50	4 50
1896—Seed, 50 bushels at 25c	12 50
Sowing seed, 2 days work at $1.50	3 00
Cutting grain, 2 days work at $1.50	3 00
Twine, 80 lbs. at 10c	8 00
Stooking, 3 days' work at $1.50	4 50
Stacking, 5 men, 1$\frac{3}{4}$ days at $1.50	13 12
Threshing (including board)	60 00
Total	$132 62

Cost per acre, 6\frac{63}{100}$.

Value of product (97$\frac{1}{2}$ bushels per acre,) 1,958 bushels at $25	489 50
Less cost of production	132 62
Leaving a net value of	$356 88

Or 17\frac{89}{100}$ per acre.

SUMMARY.

Cost per acre, of growing		wheat on	fallow	$ 5 58
do	do	do	stubble	3 56
do	do	barley	fallow	6 32
do	do	oats	do	6 63
Net returns per acre, of:—				
Wheat, grown on			fallow	$ 16 42
do	do		stubble	12 79
Barley	do		fallow	10 55
Oats	do		do	17 89

*Very much lodged and required to be cut one way, hence the increase in cost of cutting.

RESULTS OF SOWING CLOVER WITH GRAIN.

This experiment was undertaken to ascertain, 1st. Whether clover sown with grain in this climate, had any effect on the yield of grain; 2nd, whether, after the grain is cut the clover will produce sufficient foliage to be worth ploughing under, and 3rd, to ascertain how clover will succeed with grain crops.

Ten acres of fallow land divided into twenty plots of one-half acre each, were used in this test, and two plots each, of ten varieties of grain were sown. Seven days later, one plot of each variety was sown with Mammoth Red Clover, by hand at the rate of ten pounds of seed per acre and well harrowed. An extra good catch of clover was secured on all the plots sown.

The results obtained as will be seen by the accompanying table, shows: 1st. That slightly better yields of grain were obtained from plots without clover; 2nd, that there was not sufficient foliage to be worth ploughing under, and 3rd, that clover did best sown with pease.

Until about Aug. 15th, the clover on all the plots was a uniform height, but from that date, no growth was made in the plants in the wheat, barley or oat plots, while on the plots sown with pease considerable growth was made. Dry weather setting in in August, the wheat, barley and oat crops absorbed all the moisture while evidently the pease did not require so great an amount to bring the crop to maturity.

The plots were left with a view of finding out what effect, if any, the winter will have on the clover.

GRAIN and Clover sown.

Name of Variety.	With or Without Clover.	Grain ripe.	Grain, No. of days maturing.	Grain, length of straw.	Height of clover.	Grain, weight of straw.	Grain, yield per acre.		Grain, weight per bushel.
				Inches.	Inches.	Lbs.	Bush.	Lbs.	Lbs.
Wheat—									
Preston	With	Aug. 25	108	42	1 to 2	2,055	41	32	
do	Without	do 25	108	42	....	2,130	43	20	
Red Fife	With	do 29	112	39	1 to 2	1,850	39	56	
do	Without	do 29	112	39	....	1,945	41	20	
Barley—									
Sidney	With	do 25	108	36	2 to 2½	1,705	56	32	
do	Without	do 25	108	36	......	1,675	55	32	
French Chevalier	With	do 23	106	30	2 to 2½	1,760	74	16	
do	Without	do 23	106	30	....	1,705	68	30	
Odessa	With	do 13	96	30	2 to 2½	1,670	69	4	
do	Without	do 13	96	30	....	1,735	74	40	
Trooper	With	do 13	96	30	2 to 2½	1,040	59	42	52¾
do	Without	do 13	96	30	....	1,080	60	24	54
Oats—									
Banner	With	do 27	110	48	1 to 2	2,185	102	18	
do	Without	do 27	110	48	....	2,250	105	32	
Abundance	With	do 27	110	48	1 to 2	2,130	104	18	
do	Without	do 27	110	48	....	2,090	94	12	
Pease—									
Pride	With	do 22	105	30	4 to 5	....	33		65¼
do	Without	do 22	105	30	....	....	34	40	64¼
Mummy	With	do 22	105	36	4 to 5	....	31	32	66½
do	Without	do 22	105	36	....	....	32	40	65½

EXPERIMENTS WITH FLAX.

Eight plots of flax were sown for the purpose of determining the proper time to sow this grain in this climate, to ascertain whether thick or thin seeding gives the better returns, and to gain information as to the quantity and quality of the fibre pro-

duced. When the flax was ripe one-half of each plot was pulled by hand and fifty pounds of the product sent to Messrs. J. and J. Livingstone, Baden, Ont., to be tested as to value of fibre. The remaining half of each plot was cut and threshed.

The dates of seeding, quantities sown per acre and yields of the plots are as follows:—

Flax.	Sown.	Quantity seed per Acre.	Weight of Straw on ½ plot pulled.	Weight of Straw on ½ plot cut.	Yield on ½ plot pulled.	Per Acre.	
		Lbs.	Lbs.	Lbs.	Lbs. seed.	Bush.	Lbs.
Plot 1	May 16	40	86	70	30	10	40
" 2	" 16	80	101	94	36	12	48
" 3	" 23	40	89	73	31	11	4
" 4	" 23	80	106	87	37	13	12
" 5	" 30	40	87	65	32	11	24
" 6	" 30	80	103	82	35	12	28
" 7	June 6	40	76	50	24	8	32
" 8	" 6	80	93	72	29	10	20

The result points to thick seeding as being somewhat better than thin and the early seedings gave the largest yields.

EXPERIMENTS WITH INDIAN CORN.

Twenty-one varieties of corn were tested; sown in drills by ordinary hoe-drill and planted in hills by hand. The crop of all the varieties was much better than it has been for several years past.

As will be seen, the planting in hills gave the largest weight of corn which was cut green for the silo. Six varieties produced cobs before cut.

The land was clay loam, fallowed in 1895, but was rather wet when sown. The plots were one-tenth of an acre each and all were sown on the 23rd of May. The growth was strong of all the varieties excepting the last six on the list and these were medium.

Name of Variety.	Description of Variety.	Height.	When Tasselled.	In Silk.	Condition when cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
		In.				Tons.	Lbs.	Tons	Lbs.
Cuban Giant	Dent.	78	Aug. 15	Aug. 31	In Silk.	11	1100	13	1170
Sanford	White Flint.	72	" 10	" 24	Early Milk.	11	550	11	110
Compton's Early	Yellow Dent	66	" 10	" 22	In silk.	11	110	11	1210
Early Huron Dent	"	78	" 7	" 28	"	10	900	9	700
Pride of the North	Dent.	60	" 11	" 28	"	10	900	10	350
Red Cob Ensilage	White Dent.	72	" 15	" 31	"	10	680	13	730
Early Mastodon	Dent.	78	" 10	" 22	"	10	670	11	1870
Rural Thoroughbred White Flint	White Flint.	72	" 15	" 31	"	9	1800	14	50
Giant Prolific Ensilage	" Dent	72	" 15	" 31	"	9	1800	11	220
Canada White Flint	" Flint	72	" 11	" 22	Early Milk.	9	1580	9	1910
Country Gentlemen	" Dent	60	" 10	" 24	In silk	9	1580	9	1250
Angel of Midnight	Yellow Flint	60	" 11	" 20	Early Milk.	9	1580	9	1250
Leaming	Dent.	72	" 11	" 28	In silk	9	1250	12	750
Mammoth Yellow Dent	Yellow Dent	78	" 10	" 28	"	9	1140	9	1250
King of the Earliest		72	" 7	" 22	Early Milk.	9	920	10	670
White Cap. Yellow Dent	Yellow Dent	66	" 11	" 28	In silk	9	810	10	350
Mitchell's Extra Early	White Flint	60	" 1	" 11	Early Milk.	9	150	10	350
Pearce's Prolific	Yellow "	69	" 7	" 28	In silk	8	1820	8	1600
Champion White Pearl	White Dent	72	" 12	" 31	"	8	1600	10	1230
North Dakota	Yellow Flint	60	" 4	" 11	Early Milk.	8	1600	10	350
Longfellow	"	72	" 10	" 28	In silk	7	1200	9	1250

FIELD CORN.—Sown for ensilage.

Two fields of five acres each were sown for ensilage, the soil was clay loam Mitchell's Extra Early and North Dakota being used for seed.

The fields were cut by binder on August 29th, September 1st and 3rd; the corn allowed to wilt for two days and then drawn to the barn and put through the ensilage cutter before being put into silos. Mitchell's Extra Early gave the best crop and was further advanced when cut, than North Dakota; the corn being nearly in the glazed state.

Mitchell's Extra Early was grown on a field which had produced a crop of corn in 1895 after which it had been manured and ploughed. The North Dakota was sown on a stubble-field, which was manured during the winter and ploughed in May just before seeding. Both fields were sown by hoe-drill.

A variety of corn, named Vaughan's Giant Mexican was grown in one of the garden enclosures and gave the large yield of $22\frac{1540}{2000}$ tons per acre. The stocks were very large but had no sign of tassels when cut.

Name of Variety.	Date of Sowing.	Description of variety.	Height.	When tasselled.	In Silk.	Early milk.	Condition when cut.	Weight per acre grown in hills.
			In.					Tons. lb.
Mitchell's Extra Early.	May 15...	White Flint.. .	72	July 26.	Aug. 8.	Aug. 22.	Early milk..	16 120
North Dakota.........	" 18...	Yellow "	66	Aug. 1.	" 10.	" 26.	" ..	13 720

GRASS AND FODDER PLANTS.

Five varieties of grass, namely:—Awnless Brome grass, (Bromus Inermis), Timothy, Meadow Fescue, Agropyrum Tenerum, and Agropyrum Caninum were sown the past spring; also Alsike, Red and Mammoth Red clovers, all of which made a good growth. Agropyrum Tenerum headed out and was two feet high in October.

In the spring of 1895, Common and Large Late clovers were sown. Common was almost entirely killed out, only a few stalks here and there coming though the winter. The Large Late variety was completely smothered out by soil blown on to the plot during the winter and was ploughed up in the spring.

BROMUS INERMIS.

Awnless Brome grass (Bromus Inermis) returned a fine crop of hay the past season. On portions of the fields that were allowed to ripen seed the previous year, the yield was less than on parts cut for hay at the proper season.

This grass has been grown on the Experimental Farm for the past six years and has never failed to give good returns of hay or pasture. After the third crop the hay becomes very fine on account of the grass thickening very much at the roots.

Last year three thousand pounds of seed were obtained from the crop, a large portion of which was distributed in one pound packages, or sold to settlers throughout the Territories. This season about the same amount has been kept for distribution and sale, and from present appearances the demand will be largely in excess of the supply. There is, however, a considerable quantity of seed now available, in the hands of farmers in different parts of the Territories, and supplies from this source will no doubt largely increase from year to year.

Field of Awnless Brome Grass at the Experimental Farm, Indian Head, N. W. T. This was sown in May, 1896, and cattle were grazing on it early in September, 1896.

Between thirty and forty acres were sown with Bromus Inermis the past season. The first sowing was done on April 27th, and the others on May 26th and June 3rd, and in each case a good catch was obtained. The five acre field sown on April 27th was run over with mowing machine once, and later, with binder to keep weeds in check. The balance was mown over once.

Cattle were turned on the fields in September and continued to find good picking until snow fell in November. The accompanying plate is from a photograph showing cattle grazing in this field in September. The early sown produced the best crop.

This grass is better sown alone ; at least it should not be sown with a grain crop. The grain takes too much moisture from the young grass-plants, only the most vigorous of which will survive the dry weather in September ; whereas, if sown alone all the plants have an equal chance.

It is also advisable to sow the seed on soil that does not blow. Summer fallow would be the best preparation, but on account of its liability to drift it is not safe in many parts of the Territories to use this kind of land. Stubble land ploughed three or four inches deep in April or May, and well harrowed after the seed is sown, is found to be quite safe from winds as the stubble harrowed on top prevents all drifting.

Fifteen to eighteen pounds of seed is required per acre. More seed will give a better crop the first year, but less afterwards as the roots thicken up each year and in three or four years makes better pasture than hay.

The seed being light, long and thin, seeding by hand is the only practicable method. To seed properly a calm day should be chosen, so that all parts of the land may be evenly sown.

While the plants are young, weeds are sure to make great headway and it is necessary to keep them, at least from going to seed. The quickest way to accomplish this is to go over the field with a mower, cutting just above the grass-plants. If this operation has to be repeated it will be necessary to cut the tops of the grass, but this will not injure the plants, in fact it is an advantage in the way of giving the roots a better hold.

The first crop of hay can be cut the next year after seeding, and will, in ordinary years be ready early in July. Eight or ten days after being ready to cut for hay it will be fit to cut for seed if so desired.

On this farm it has always been cut in first blossom for hay and ten days from this time it is considered in proper state to cut for seed.

In cutting for seed a binder is used and the grass is cut, tied and stooked the same as wheat or other grain. In a week or ten days after cutting it is ready to thresh or store away as deemed best.

For threshing small quantities the old-fashioned flail is suitable, but for large lots a threshing machine should be used on which the wind has been closed off as much as practicable. From three to six hundred pounds of seed may be expected from an acre.

Since July 3rd all the farm horses and bulls have been fed on brome hay and there has been less waste than with any other hay ever used on the farm.

CANARY SEED GRASS.

This grass has done very well on the farm, but is an annual and has to be sown each spring. This, however, is not very expensive as the seed is easily grown.

Like all other grasses, if left to ripen its seed it is not very good for hay, but if cut early it makes fair fodder.

Last spring one acre was sown, part of which was land subject to drifts from adjoining fields and had received, during the winter a heavy coating of this drift-dirt. Under these conditions the yield was less than usual.

Six hundred pounds of canary seed were obtained from the acre and as the seed is much better than can be bought in the Territories, the crop is a valuable one even with the somewhat low yield of six hundred pounds per acre.

TARES.

One-tenth acre of white tares was sown on May 27th and cut for seed on September 8th, yielding 215 pounds or 35·50 bushels per acre.

BUCKWHEAT.

A plot of one-fifth acre was sown with buckwheat for bees. Sown May 27th, cut for seed August 25th ; yield per acre 14·26 bushels. The straw was a heavy crop two feet high.

MILLETS, COMMON AND GOLDEN AND HUNGARIAN GRASS.

Millets and Hungarian grass were sown on one-tenth acre plots. The plot of Hungarian grass headed out and the seed was about half formed when the plot was cut. The millets did not head. One-half acre of common millet was sown for the silo. The one tenth acre plots when cut were allowed to dry and were fed as hay.

					Per Acre. Tons.	Per Acre. Pounds.
Millet—Common $\frac{1}{10}$ acre,	Sown	May 26,	Cut	Sept.	9....2	700
—Golden	"	"	"	"	9....2	400
—Common $\frac{1}{2}$ acre	"	"	"		7....3	1800
Hungarian Grass $\frac{1}{10}$ acre	"	"	"		9....2	1000

RYE AND MIXED GRAIN FOR FODDER.

One-tenth acre plot of rye and four one tenth-acre plots of mixed grain were sown for fodder, on 6th May and cut by binder on 20th August. All these plots were allowed to partially mature before being cut.

		Per acre.		Tons.	Lbs.
I	Rye, spring,	$1\frac{1}{2}$ bushels,	weight per acre dry,	2	280
II	Red Fife Wheat, Banner Oats, California Prolific Barley,	1 bushel, 1 do 1 do	do	3	320
III	Banner Oats, Multiplier Pease,	1 bushel. 1 do	do	2	600
IV	Banner Oats, California Prolific Barley,	1 bushel, 1 do	do	2	800
V	Banner Oats, Multiplier Peas,	1 bushel, 1 do	do	2	20

FLAX.

One and one-half acres sown 26th May, and cut 22nd August. Yield per acre, 16·20 bushels.

EXPERIMENTS WITH TURNIPS.

Fourteen varieties of turnips were tested on fallow land. The soil was clay loam, and as the land was too wet to drill up, a grain drill was used to make marks every thirty inches and the seed was sown by turnip drill in these marks. The plan answered very well and there were no misses or blanks in the plots.

All the varieties looked well from the start. Dry weather in September was against a heavy yield, but all returned a very even crop of roots.

Two seedings were made of each kind, the first on the 30th of May and the second on the 13th of June, and the roots from both were gathered on the 6th of October. As shown in the following table, the earliest sown gave the largest returns. The yield per acre has been calculated in each case from the weight of roots gathered from two rows each 66 feet long.

TURNIPS—Test of Varieties.

Name of Variety.	Yield per Acre.							
	1st Plot.		1st Plot.		2nd Plot.		2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Purple Top Swede	24	840	814		21	1,560	726	
Perfection	23	1,520	792		19	1,336	655	36
Hartley's Bronze	23	332	772	12	18	960	616	
Prize Winner	21	1,560	726		19	16	633	36
Skirving's	21	1,560	726		18	1,752	629	12
Selected Champion	21	240	704		19	676	644	36
Mammoth Clyde	20	920	682		16	472	541	12
Prize Purple Top	19	1,996	666	36	17	584	576	24
Marquis of Lorne	19	280	638		15	1,680	528	
Sutton's Champion	19	280	638		14	1,568	492	48
Carter's Elephant	18	1,752	629	12	15	1,020	517	
Giant King	18	1,488	624	48	18	168	602	48
Jumbo or Monarch	18	696	611	36	13	928	448	48
East Lothian	18	432	607	12	16	736	545	36

EXPERIMENTS WITH MANGELS.

Fourteen varieties were tested on clay loam. In sowing, the same plan was adopted as with the turnips, and it gave good satisfaction.

Two sowings were made of each variety, the first on the 30th of May and the second on the 13th of June, and the roots of both were pulled on the 30th September. The early seeding has given the best returns. On account of the very dry fall, none of the sorts gave large returns, but the roots were of very fine quality. The Globe varieties gave the largest crops and the best roots.

MANGELS—Test of Varieties.

Name of Variety.	Yield per acre. 1st Plot.		Yield per acre. 1st Plot.		Yield per acre. 2nd Plot.		Yield per acre. 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Red Fleshed Globe	16	736	545	36	10	1,780	363	
Champion Yellow Globe	16	736	545	36	12	24	400	24
Mammoth Long Red (Webb)	15	1,812	530	12	11	440	374	
Giant Yellow Globe	15	1,548	525	48	15	624	510	24
Yellow Intermediate	15	1,152	519	12	14	1,040	484	
Mammoth Long Red (Steele)	15	1,152	519	12	14	512	475	12
Red Fleshed Tankard	15	888	514	48	13	400	440	
Giant Yellow Intermediate	15	756	512	36	11	1,648	393	48
Mammoth Long Red (Evans)	15	360	506		12	1,080	418	
Golden Tankard	15	228	503	48	11	176	369	36
Golden Fleshed Tankard	15	228	503	48	11	176	369	36
Gate-post	14	1,304	488	24	10	1,648	360	48
Warden Orange Globe	13	1,720	462		16	1,528	558	48
Canadian Giant	13	400	440		13	1,456	457	36

EXPERIMENTS WITH CARROTS.

Fourteen varieties of carrots were tested on clay loam. One sowing only was made on the 18th of May, and the roots were pulled on the 5th of October. None of the sorts gave a large yield, but all were much better than in any former test. The highest returns were from the Short White varieties.

The land used was summer fallow, not ploughed in the spring. The rows were made on the flat by grain drill and the seed sown by the turnip drill. The yield per acre has been calculated from the weight of roots gathered from two rows, each 66 feet long.

CARROTS—Test of Varieties.

Name of Variety.	Yield per Acre, 1st plot.		Yield per Acre, 1st plot.	
	Tons.	Lbs.	Bush.	Lbs.
Half-long White	13	1,852	464	12
Half-long Chantenay	13	1,192	453	12
Mammoth White Intermediate	13	268	437	48
Iverson's Champion	13	131	435	36
White Belgian	12	948	415	38
Improved Short White	12	156	402	36
Short White Vosges	11	1,364	389	24
Oxheart or Guerande	11	1,364	389	24
Early Gem	10	1,648	360	48
Giant Yellow Intermediate	10	724	345	24
Scarlet Intermediate	10	592	343	12
Carter's Orange Giant	9	1,800	330	..
Long Scarlet Altringham	8	1,556	292	36
Long Orange or Surrey	7	1,444	257	24

EXPERIMENTS WITH SUGAR-BEETS.

These were on clay loam, the first set of plots was sown on the 30th May, and the second on the 13th June; both were pulled on 30th September. The yield per acre has been calculated in each case from the weight of roots gathered from two rows each 66 feet long.

Name of Variety.	Yield per Acre, 1st plot.		Yield per Acre, 1st plot.		Yield per Acre, 2nd plot.		Yield per Acre, 2nd plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Lane's Improved	14	1,400	490	..	13	100	435	..
Vilmorin's Improved	12	1,560	431	..	9	1,800	330	..
Austrian Electoral Wohanka	12	.....	400	..	11	140	369	..

STORING ROOTS.

In the fall of 1895 two pits of turnips, two of cabbage and one of potatoes and onions were made in the field to ascertain whether these roots and vegetables could be safely kept through the winter in that manner.

One pit of turnips was put below the surface by digging a hole three feet deep by three wide, in which the roots were filled to a slope just above the surface of the ground. The other pit was made on the top of the ground.

When opened in April, the turnips in the deep pit were found to be all rotten, caused, no doubt, by too much heat. The roots in the pit on the surface were taken out in splendid condition.

The two pits of cabbage were made in the same way, except that when filling the dug pit the cabbage were left below the surface and boards laid across the pit to keep the weight of covering from the heads.

When the dug pit was opened the cabbage on the outer sides were found to be partially rotted, from too much heat. Those pitted on the surface were in good condition; many of the heads being in better shape than those stored in a root cellar.

The pit for potatoes and onions was dug three feet deep and filled to the level of the ground with potatoes, the onions having been placed at the bottom of one end of the pit. When opened the top half of the potatoes was found frozen: the remainder of the potatoes and onions being perfectly sound. There were about twenty bushels of potatoes in the pit, which were not sufficient to retain the heat.

All the pits were covered in the same way—1st, a layer of straw and four inches of earth; 2nd, after the first covering of earth was frozen, a second layer of straw and four inches more earth were added; and 3rd, before very cold weather set in in December, a covering of coarse manure was put over all. Ventilators were placed in all the pits and closed when hard frost came.

The results of these tests show; 1st that turnips and cabbage are better hilled on top of the ground and 2nd that potatoes require to be put below the surface.

EXPERIMENTS WITH POTATOES.

One hundred varieties of potatoes were planted in 1896. The yield of many was small, while others gave very satisfactory returns.

Before planting, the tubers were treated with corrosive sublimate for scab. Each variety was put in a bag and dipped in a solution of two ounces of corrosive sublimate dissolved in fifteen gallons of water, then taken out, drained, and when dry, cut. Four days after, they were planted in drills thirty inches apart. With nearly all the sorts the treatment proved effectual, although a few very scabby varieties are still somewhat affected.

In 1894, a solution of one ounce of corrosive sublimate to fifteen gallons of water was used, but that proved too weak. This year the strength was doubled and the results were much more satisfactory.

The potatoes were planted on the 18th May, on clay loam, and dug on the 1st of October. All the varieties made a strong growth. The yield per acre has been calculated in each case from the weight of tubers gathered from two rows, each 66 feet long.

Potatoes—Test of Varieties.

Name of Variety.	Average Size.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Un-marketable.		Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
American Wonder	Large	413	36	383	36	30		White.
Empire State	Small	389	24	364	24	25		"
American Giant	Large	376	12	366	12	10		"
London	"	376	12	350	12	26		Red.
Brownell's Winner	Small	369	36	337	36	32		"
Lizzie's Pride	"	369	36	342	36	27		White.
Vanguard	Large	367	24	345	24	22		Red.
Late Puritan	"	345	24	325	24	20		White.
Lee's Favourite	Small	345	24	315	24	30		Red and white.
Carman No. 1	Large	345	24	330	24	15		Pink.
New Queen	Small	341		316		25		Red.
Puritan	Large	336	36	300	36	36		White.
Everett	"	334	24	312	24	22		Red.
Morning Star	Small	332	12	300	12	32		Brown.
Money-maker	Large	332	12	318	12	14		White.
Crown Jewel	"	332	12	296	12	36		Brown.
Clarke's Extra Early	"	330		315		15		Pink.
State of Maine	"	321	12	300	12	21		White.
Monroe County	Small	316	48	300		16	48	Brown.
Early Harvest	Large	314	36	300	36	14		White.
Pearce's Prize Winner	"	314	36	300	36	14		"
Beauty of Hebron	Small	312	24	290	24	22		Brown.
Victor Rose	Large	312	24	300	24	12		Red.
Dreer's Standard	Small	312	24	294	24	18		White.
Burpee's Extra Early	"	312	24	300	24	12		Brown.
Vick's Extra Early	"	310	12	286	12	24		Red.
Troy Seedling	"	310	12	290	12	20		White.
Early Gem	"	310	12	286	12	24		Brown.
Irish Daisy	"	301	24	270	24	31		White.
Polaris	Large	301	24	280	24	21		"
Pride of the Market	"	301	24	285	24	16		"
New Variety No. 1	"	299	12	290	12	9		"
Daisy	Small	297		280		17		Brown.
Rural Blush	Large	294	28	280		14	28	Red.
Great Northern	"	294	28	280		14	28	White.
Early Puritan	Small	294	28	276		18	28	"
Ideal	Large	294	28	282		12	28	Red.
Sharpe's Seedling	Small	292	36	270		22	36	"
Maggie Murphy	Large	290	24	280	24	10		"
I.X.L.	Medium	290	24	270	24	20		Brown.
Clarke's No. 1	Large	288	12	280	12	8		Pink.
Early Sunrise	Small	286		262		24		Red.
Holborn Abundance	Large	283	48	270		13	48	White.
Pearce's Extra Early	Small	281	36	260	36	21		Brown.
Dakota Red	Large	281	36	271	36	10		Red.
Clay Rose	Small	279	24	254	24	25		"
McKenzie	Large	279	24	264	24	15		White.
Seattle	Small	279	24	250	24	29		"
Early White Prize	Large	279	24	270	24	9		"
General Gordon	Small	277	12	230	12	47		Red.
Carman No. 1	Large	275		267		8		White.
Seedling No. 230	Small	272	48	242	48	30		"
Wonder of the World	"	272	48	261	48	11		Brown.
Northern Spy	Large	270	36	270	36			Red.
Toronto Queen	Small	268	24	244	24	24		Brown.
Primrose	"	268	24	240	24	28		Red.
Burnaby Seedling	Large	268	24	242	24	26		Pink and white
Great Divide	Small	261	48	241	48	20		White.
Green Mountain	Large	261	48	249	48	12		"
Charles Downing	"	261	48	247	48	14		"
Flemish Beauty Seedling	"	259	36	250	48	9		Red.
Prize Taker	Small	253		225	36	28		"
Earliest of all	"	253		220		33		Brown.
Pride of the Table	Large	250	48	230	48	20		Pink.
Chicago Market	Small	248		224		24		Brown.
Vanier	"	248	36	200	36	48		Red.

POTATOES—Test of Varieties—*Continued.*

Name of Variety.	Average Size.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Un-marketable.		Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Rochester Rose	Large	246	24	223	24	23		Brown.
Reading Giant	Small	246	24	213	24	33		Red.
Algoma No. 1	"	246	24	210	12	36		"
Early Rose	"	244	12	224	12	20		"
Scotland	"	244	12	200	12	44		White.
Delaware	"	244	12	217	12	27		"
Early Norther	Large	242		222		20		"
Hale's Champion	Small	239	48	203	48	36		"
White Beauty	"	237	36	207	36	30		"
Harbinger	"	237	36	200	36	37		Brown.
Peerless Junior	Large	237	36	216	36	21		White.
Russell Seedling	Small	226	36	200	36	26		"
Early Six Weeks	"	224	24	200	24	24		Red.
Seedling No. 214	"	224	24	196	24	28		White.
Hopeful	"	220		205		15		"
Freeman	"	217	48	189	48	28		"
Stourbridge Glory	"	217	48	189	48	28		"
Queen of the Valley	Large	217	48	200	48	17		Red.
Algoma	"	209		200		9		Brown.
Early Ohio	Small	206	48	179	48	27		Red.
Satisfaction	"	206	48	184	48	22		"
Lightning Express	"	200	12	164	12	36		"
Orphan's	"	198		170		28		White.
Thorburn	"	195	48	163	48	32		"
Record	"	187		161		26		
World's Fair	Large	169	24	160	24	9		"
Brown's Rot Proof	"	132		120		12		Red.
Table King	"	127	36	110	26	17		White.
She	Not weighed.							
Seedling No. 1								
Seedling No. 7								
Seedling No. 169								
She No. 2								

VEGETABLE GARDEN.

The garden vegetables did very well the past season. This was especially the case with beans and tomatoes, which in previous years have not, as a rule, ripened, on account of early frosts in the fall.

ASPARAGUS.

Three varieties were grown, Conover's Colossal, Barr's Mammoth, and Donald's Elmira. The first named variety gave the best cuttings, as the other two have not been long enough planted to be at their best. First used, 6th May; continued two months.

BEANS.

Fifteen varieties, including six sorts from seed received from Germany, were tested. Sown 14th May. The names of the varieties tested are: Broad Windsor, Dwarf White Butter, Kenney's Rust Proof, Early Valentine Wax, Black Eyed Wax, Pearce's Golden Beauty, Snow Pod, Wardwell's Kidney Wax, and Early Six Weeks, all of which ripened except Broad Windsor.

The German varieties were: Heinrich's Giant, Flageolet Wax, Giant White Wax, Giant Croadsworth (climber), Don Carlos (climber), and Flageolet Wax (climber), none of which ripened. Kenney's Rust Proof was entirely free from rust, all the rest being more or less affected. Dwarf White Butter produced the largest crop and is the best variety tried.

The seven varieties first mentioned were again sown on 26th May, when Early Six Weeks, Wardwell's Kidney Wax and Pearce's Golden Beauty gave the best returns.

BEETS.

Ten varieties were grown. All sown on 30th April and lifted 29th September. Names: Improved Dark Red (German seed), Eclipse, Arlington's Favourite, Dewing's Improved Blood Turnip, Nonsuch, Olive-shaped, Bonsecour's Market, Black Prince, Bruce's Fine Long Dark and Edmund's Blood Turnip.

The best varieties in colour, shape and quality were: Eclipse, Olive-shaped, Nonsuch, and Black Prince.

The largest crops were from: Bonsecour's market, 1,532 bushels per acre; Bruce's Fine Long Dark, 1,532 bushels per acre, and Improved Dark Red (German) 1,411 bushels per acre.

CABBAGE—Sown in hot-bed April 9th, transplanted into frames May 7th, transplanted into garden June 2nd.

Name of Variety.	Fit to Use.	Lifted.	Weight.	Remarks.
			Lbs.	
German Seed.				
Fielder	Sept. 1	Oct. 13	16	Very fine pointed heads.
Etampes	July 20	" 13	8	Good heads.
Savoy—Dwarf Early Yellow	" 20	Sept. 1	6	Early and small.
Savoy—Lorenz's Favourite	" 20	" 1	8	" "
Savoy—Brunswick	" 28	" 1	8	" "
Brunswick	Sept. 1	Oct. 13	13½	Fair quality; did not head well.
Imported Red Pickling	Aug. 15	" 13	9	Good heads.
Early Dwarf Blood Red	" 15	" 13	8	Very dark; headed well.
Brussell's Sprouts	Sept. 1	" 13	......	Very fine: 2 ft. high; covered with sprouts.
Kale—Lorenz's Garnishing	" 1	" 13	......	Fair.
Kohl-rabi—Erfurt Early	" 1	" 13	10	Very large and good shape.
Canadian Seed.				
Henderson's Early Summer	Aug. 1	Oct. 13	15	Extra good; one of the best.
Early Standard	July 25	Sept. 1	10	Very early.
Very Early Etampes	" 20	" 1	12	"
Jersey Wakefield	" 25	" 1	8	"
Largehead—Exp. Farm seed	Oct. 1	Oct. 13	12	Did not do well; few heads formed.
Burpee's Allhead	Sept. 11	" 13	16	Extra good; every plant headed.
Mason's Large Late Drumhead	" 15	" 13	16	Very good.
Surehead	" 10	" 13	23½	Large, solid; one of the best.
Matchless Flat Dutch	" 10	" 13	20	Extra good; large, solid.
Auvergne Quintal	" 15	" 13	16	Large, loose.
Bruce's Winter	Oct. 1	" 13	16	Not more than half the plants headed
Autumn King	" 1	" 13	16	" " "
Large German Savoy	Sept. 1	" 13	15	Large and very fine.
The Lupton	" 1	" 13	16	Extra good; all headed.
Red Dutch Drumhead	" 1	" 13	19	Very good "

CAULIFLOWER.—Sown in hot-bed April 9th, transplanted into frames May 7th, transplanted into garden June 2nd.

Name of Variety.	Fit for Use.	Duration.	Per cent Headed.	Remarks.
Gilt Edge	July 16	1 month	100	All headed; good quality.
Early Dwarf Erfurt	" 20	1 "	100	" "
Autumn King	Sept. 20		10	Very few headed.
Veitch's Autumn Giant				Seed bad.
Extra Early Erfurt	July 16	1½ months	100	All headed; good size and quality.
Giant White Pearl	" 17	1½ "	90	Nearly " " "
Best of All	" 16	1½ "	100	All " " "
Early White Head	" 16	1½ "	100	All " " "

Sown in frames without glass.

Name of Variety.	Sown.	Transplanted.	In Use.	Duration.	Remarks.
Giant White Pearl	May 14	June 16	Sept. 1	1½ months	Very fine.
Extra Early White Head	" 14	" 16	" 1	1½ "	"
Extra Early Erfurt	" 14	" 16	" 1	1½ "	"

CARROTS.

Nine varieties were tested: Half-long Scarlet Nantes, Half-long Red, Oxheart or Guerande, Half-long pointed, Half-long Scarlet Chantenay, New Long Red Meaux, Peer of all, Half-long Scarlet, and Danver's Half-long were sown on 28th April and were fit for use 15th to 20th July and lifted October 1st.

Half-long Scarlet Nantes and Half-long Red were the best in shape and quality; and Half-long Scarlet Chantenay produced the largest crop, 988 bushels per acre.

CELERY.

Six varieties were tested: White Plume, Pink Plume, Paris Golden Yellow, New Triumph, Seymour's Giant and Large Golden Heart. These were sown in hot-bed 4th April, transplanted to cold frame 6th May, and set out in garden 16th June. All were planted in trenches dug 18 inches deep. Six inches of well rotted manure was placed in the bottom of the trench and well tramped, then six inches of surface soil, in which the plants were set. One row of Paris Golden Yellow was planted on the surface and earth heaped up as the plants grew. The celery in the trenches produced much the best heads. White Plume, Pink Plume, Paris Golden Yellow and New Triumph were the best varieties.

CORN.

Nine varieties of early corn were tried: Burbank's, Ewing's Champion Sugar, First of all (McInnis), First of all (Bruce), White Cory, Vaughan's Jehu, Native Corn, Early Crosby and Early White Cory; and one variety of very late corn, Vaughan's Giant Mexican. These were planted in one of the garden enclosures on 22nd May and being well protected from winds by the hedges, all made a large growth.

The Native or Squaw corn ripened first, but the ears were very small. This variety can be depended upon to mature every year. Vaughan's Jehu matured the best of any and promises to be an excellent variety for this district.

First of all (Bruce), First of all (McInnis) and Vaughan's Jehu would be good varieties to grow for ensilage on account of their earliness and vigour of growth.

Vaughan's Giant Mexican, mentioned in the report on field-corn, made a very large growth of stalks but did not even tassel.

CITRONS.

Common and Colorado Preserving were sown in hot-beds on the 16th April. They were set out in frames in the garden on 22nd May, and were fit to use on 15th August. The Common variety weighed 9 pounds, and the Colorado Preserving, 12 pounds.

The same varieties were sown in the garden on 22nd May and were fit to use on 1st September. The weight was 6 and 9 pounds respectively.

CUCUMBERS.

New Siberian, Evergreen White Spine, Giant Pera, White Wonder and Pride of Canada were sown in hot-beds on 16th April, and transplanted to frames in the garden on 22nd May. The new Siberian was fit to use on 1st July, White Wonder 5th July, and Giant Pera and Evergreen White Spine on 12th July. Pride of Canada did not grow. Giant Pera produced the best crop and was the finest in shape and quality.

New Siberian, Evergreen White Spine, Giant Pera and Thoroughbred White Spine were sown in frames in the garden on 22nd May; the latter variety gave the best crop.

LETTUCE.

Big Boston, Black Seeded Simpson, Grand Rapids, Blonde Beauty, Pearce's Wonderful, Gardener's Favorite and Ohio Cabbage were sown on 30th April. Black Seeded Simpson was fit to use 10th June, Big Boston on 20th, and the others on 15th June. The best varieties were Big Boston and Black Seeded Simpson.

The same seven varieties, and five German sorts in addition, Lorenz's Favourite, Fearnaught, Standard Yellow, American Curled and White Paris Cos were sown on 16th May. Lorenz's Favorite was the best of the German varieties, and Black Seeded Simpson was first of the Canadian sorts.

HERBS.

Parsley: Covent Garden, Moss Curled and Curled, a German variety, were sown on 16th May, and were fit to use on 1st August. All did well. The German seed came up the the best.

ONIONS—Transplanted.

Name of Variety.	In Hot-bed. Sown.	In Hot-bed. Up.	Transplanted to Garden.	Lifted.	Bushels per Acre.
Leek	Did	not germ	inate.		
James Keeping	"	"	"		
Prize Taker	April 4	April 20	June 4	Sept. 16	484
Mammoth Silverskin	" 4	" 20	" 4	" 16	242
Mammoth Pompeii	Did	not germ	inate.		
Oxonian Prize	April 4	April 20	June 4	" 16	242
Ailsa Craig	Did	not germ	inate.		
Extra Early Wethersfield	April 4	April 20	June 4	" 16	342
Selected Yellow Danvers	" 4	" 20	" 4	" 16	282
Large Red Globe	" 4	" 20	" 4	" 16	463
Large Yellow Flat Danvers	" 4	" 20	" 4	" 16	262
Giant Rocca	Did	not germ	inate.		
Danvers Globe	April 4	April 20	June 4	" 16	484
Red Victoria	" 4	" 20	" 4	" 16	645
Large Red Wethersfield	" 4	" 20	" 4	" 16	336
Rose Monster	" 4	" 20	" 4	" 16	243

ONIONS—Sown in Open Ground.

Name of Variety.	Sown.	Up.	Lifted.	Bushels per Acre.
Selected Yellow Danvers	April 28..	May 20..	Sept. 16..	242
Large Yellow Flat Danvers	" 28..	" 20..	" 16..	342
Yellow Globe Danvers	" 28..	" 20..	" 16..	342
Large Red Wethersfield	" 28..	" 20..	" 16..	302
Large Red Globe	" 28..	" 20..	" 16..	262
White Queen	" 28..	" 20..	" 16..	203
Small White Nocera	" 28..	" 20..	" 16..	223
Mammoth Silverskin	" 28..	" 20..	" 16..	223
Prize Taker	" 28..	" 20..	" 16..	262
Shalots	" 28..	" 20..	" 16..	302
Extra Early Red Wethersfield	" 28..	" 20..	" 16..	302

SUMMER SAVORY.

Summer savory from Germany and seed of the same herb from Steele, Briggs Co. were sown 16th May. Both did well and apparently there was no difference in the two sorts.

Sage.—Broad leaved, sown 16th May, fit to use 1st August; a fair crop.

Borage.—German seed, sown 16th May, a wonderful bee plant, bees were on it continually; a good crop.

Dill.—German seed, sown 16th May; a good crop.

MELONS.

Jersey Belle (Musk) and Phinney's Early (Water) were sown in hot-beds 16th April and transplanted to frames in the garden 22nd May. Jersey Belle ripened on 5th September and Phinney's Early on 12th September. The frames were taken off when danger of spring frosts was past and put on again early in September when all the fruit ripened. Glass was used in the frames.

PEASE.

Twelve varieties, viz.:—C. P. R., Alaska, Wm. Hurst, Nott's Excelsior, S. B. M. Co.'s Extra Early, Little Giant, Bruce's Extra Early, Horsford's Market Garden, Forty-fold, American Wonder, Burpee's Profusion and Schwanzer's Giant, a German variety, were sown on 15th May.

The C. P. R. was by far the finest variety for the table but is late. In quality and size it cannot be beaten. American Wonder, Wm. Hurst and Horsford's Market Garden were also extra good. Alaska and S. B. M. Co.'s Extra Early were the earliest, being fit for use 1st July, followed by Bruce's Extra Early, on 3rd July. C. P. R. did not come into use until 24th July.

RADISH

Sowings were made on 4th April in the hot-bed; and on 30th April, 16th May and 27th June in the garden of Scarlet Turnip-Rooted, White Tipped Scarlet, Rosy Gem, Pearl Forcing, Early Scarlet, Olive Shaped, and Long Scarlet, Short-top. To the third sowing Dark Scarlet, Olive Shaped Red and Munchausen's White, three German varieties; and Rose China Winter and Black Winter were added.

All did well except those sown on April 30th, all of which were full of worms and unfit for use.

Pearl Forcing was one of the best varieties sown.

PUMPKINS AND SQUASH.

Mammoth Pumpkin, Hundred Weight Pumpkin, Red Hubbard Squash, Sutton's Vegetable Marrow, Long Green Marrow, Long White Bush Marrow and Scallop Squash were sown in small frames in the garden on 22nd May. Mammoth and Hundred Weight pumpkins ripened on 1st September. Weight 20 to 30 lbs., very few on vines. The marrows and squash were a good crop and the Long White Bush matured some specimens two feet long.

RHUBARB.

Four varieties were grown. Victoria, Linnæus, Tottle's Improved and Stott's Mammoth. Victoria and Linnæus are the best varieties. Tottle's Improved is a larger but coarser sort. Stott's Mammoth is very large and coarse.

TOMATOES.

Seven varieties; Early Leader, Yellow Plum, Earliest of All, The Imperial, Everbearing, Pear-shaped Yellow and Lorenz's Forerunner (German)—the latter did not germinate.

Earliest of All produced ripe tomatoes on 3rd July; Early Leader and Yellow Plum on 12th July; Everbearing on 3rd August; Pear-shaped Yellow 12th August and The Imperial on 5th September. Early Leader gave the largest crop of early tomatoes. The Imperial, was covered with a frame and glass on 5th September and ripened all its fruit; producing the best crop and finest fruit ever grown on the farm. Early Leader and Earliest of All ripened their fruit without protection.

Some plants of all the varieties were pruned back, which helped greatly in setting and ripening the fruit. The same varieties not pruned back did not ripen but gave a very large yield of green tomatoes.

CABBAGE PLANTED FOR SEED.

In the fall of 1895, nine varieties of cabbage were packed in dry earth in a root cellar and next spring were planted for seed, with the following results.—

Heads.		
4	Surehead, produced	14 oz. seed.
3	Vanguard	21 " "
2	Louderbach's	13 " "
2	Nonesuch	12 " "
1	World beater, rotted	
1	Bruce's Winter	8 " "
1	Large Late Drumhead	7 " "
2	Burpee's All Head	13 " "
4	Mixed	14 " "

The seed grown on the Experimental Farm in former years has always germinated more quickly and grown more vigorously than eastern grown seed.

FLOWER GARDEN.

ANNUALS.

Name of Variety.	Sown in Hot-bed.	Transplanted.		In Flower.		Remarks.
		Hot-bed.	Garden.	From	Till	
Asters—						
7 varieties Dwarf Pæony, flowered	April 4	May 4	June 6	Aug. 15	Frozen	All the asters were late in coming into bloom, but were fine and stood several hard frosts without much injury.
7 varieties Comet	" 4	" 4	" 6	" 15	"	
7 " Dwarf Bouquet.	" 4	" 4	" 6	" 15	"	
Lilliput., 7 varieties	" 4	" 4	" 6	" 15	"	
Acroclinium	" 4	" 4	" 6	" 1	"	Very good.
Verbena, 7 varieties	" 4	" 4	" 6	July 15	"	Not so showy as formerly.
Single Dahlia, 7 varieties	" 4	" 4	" 6	" 1	"	Did not make much show.
Stocks—						
Dwarf Bouquet	" 4	" 4	" 6	" 1	"	Extra fine; one of the best flowers for this climate.
Pink of Perfection	" 4	" 4	" 6	" 1	"	
Germanten Weeks	" 4	" 4	" 6	" 1	"	
Pyrethrum Golden	" 4	" 4	" 6	....	....	Made a good border.
Double Petunias, 7 varieties	" 4	" 4	" 6	July 1	Frozen	Very few plants were double, but the single ones were extra fine and made a showy bed.
Gaillardia Lorenziana	" 4	" 4	" 6	Aug. 1	"	Hardy; good flower for N. W. T.
Scarlet Flax	" 4	" 4	" 6	July 1	"	One of the best.
Dianthus, 3 varieties	" 4	" 4	" 6	" 15	"	Very good.
Salpiglossis	" 4	" 4	" 6	Aug. 1	"	Fair.
Ice plant	" 4	" 4	" 6	....	....	Made too much growth.
Calliopsis	" 4	" 4	" 6	Aug. 1	"	Hardy and showy.
Phlox Drummondii	" 4	" 4	" 6	July 1	Sept. 1	Showy.
Everlastings—						
Helichrysum	" 4	" 4	" 6	" 15	" 1	Did well.
Xeranthemum	" 4	" 4	" 6	" 15	" 1	"
Helipterum	" 4	" 4	" 6	" 15	" 1	"

ANNUALS SOWN IN GARDEN.

Pansies—The old bed was all winter killed, but came up thickly and very early with seedlings, which when thinned out made a showy bed all the season.

Pansies—14 varieties; sown 15th July; in flower 1st September. Flowers extra fine and remarkably true to colour.

Mignonette—6 varieties; sown May 8th; in flower 1st July. Extra good; in flower all season.

Sweet Pease—12 varieties; sown 8th May; in flower 20th July. Extra good; grew four feet high and flowered all season.

Dwarf Nasturtium—12 varieties. Made an extra fine border; bloomed very freely but was killed by first frost.

Phlox Drummondii—Sown 8th May; in flower 1st July. Very fine; the flowers larger than those sown in hot-bed.

Candytuft—12 varieties; sown 8th May; in flower 1st July. Made a very fine border, the different colours being very effective.

Calendula—Came up from seed shed last year. Flowers only semi-double.

Sweet Alyssum—Sown 8th May; in flower 20th July. Made very pretty border.

Larkspur—Sown 8th May; in flower 20th July. Extra fine; remained in bloom till everything was frozen up.

Poppy—Made a good show.

Escholtzia (*California Poppy*)—Sown 8th May; in flower 29th June. Extra fine; one of the best annuals.

PERENNIALS.

Pæony—In bloom 27th June, was extra fine. The plants were covered with flowers 6 inches in diameter and very hardy. Thirteen new named varieties were received from the Central Experimental Farm, Ottawa, this year, and have made good progress.

Sweet William.—In bloom 1st June; very fine; made a good show.

Scarlet Lychnis.—In bloom 1st June; showy and hardy.

Veronica.—In bloom 1st June; showy.

Platycodon grandiflorum.—In bloom 15th July; hardy.

Delphinium grandiflorum.—In bloom 1st July; showy and hardy.

Aquilegia (Columbine).—In bloom 1st July; showy and hardy.

Phlox Perennial.—In bloom 1st August; showy and hardy.

Yellow Flax.—In bloom 10th July; extra fine; hardy.

Garden Pink.—In bloom 15th June; extra fine; hardy.

Forget-me-not.—In bloom 1st June; does not stand hot sun.

Everlasting Pea.—In bloom 1st August; grew 5 ft. high.

Iceland Poppy.—In bloom 29th June; very showy and hardy.

Oriental Poppy.—In bloom 29th June; very showy and hardy.

BULBS.

Planted 1896.

Gladioli.—Planted 16th April in pots in hot-bed. Transplanted to garden 6th June; did fairly well; flowers medium in size.

Gladioli.—Planted on 8th May in garden; not so early as those started in pots but flowers were larger.

Planted 1894.

Tulips.—Planted fall 1894; in flower on 8th May and made a great show.

Scilla sibirica.—Planted fall 1894; very pretty and hardy; requires to be in a thick mass to make much show.

A large collection of bulbs of many varieties was received from the Central Experimental Farm, Ottawa, early in October. They were immediately planted in the garden and in pots and boxes, and will be reported on next year.

FRUIT TREES AND BUSHES.

The past season has been a very favourable one for cultivated fruits. Of the native varieties, some localities had an abundance, while in others the supply was small. Blossoms were plentiful but fell off before seeding. The small cultivated fruits on the farm gave an excellent crop, raspberries and currants in particular.

APPLES.

One apple tree, Grandmother, planted in 1889, which has been cut back several years, produced one blossom, which, however, did not form fruit.

A plantation of fifty trees of fifteen varieties of Pyrus, received from the Central Experimental Farm, Ottawa, was set out in May last, and to those were added sixty-one Pyrus trees, transplanted from those set out in 1894. All those planted in 1894 have thus far proven hardy.

PLUMS.

Two Manitoba plum trees yielded a large crop of very small sized fruit. The Weaver plum seedlings planted in 1894, continue to do well and are expected to produce fruit next season. In addition to the two mentioned there are Imperial Blue, Speers, De Soto, Voronesh and Hungarian Seedlings, all doing well. These trees were planted in 1894, and give promise of fruit the coming year.

The forty-nine varieties of native Manitoba Plums, received from J. Frankland, Stonewall, Manitoba, in the spring of 1895, are, with a few exceptions, doing well. Last spring this plantation was increased by thirty-nine varieties received from Minnesota, United States, all of which are doing well.

CHERRIES.

Two trees of the sand cherry gave a good crop the past season but the fruit was rather small. A plantation of this fruit numbering 172 trees produced a few cherries this year and promises to bear well next season.

The following varieties of cherries planted in 1894, will it is hoped bear fruit next year—seedlings of Minnesota, Ostheim, Carnation and Lithaur Weichsel.

GRAPES.

Bacchus.—Planted 1894. Growth very weak.
Gibb " "
Native Manitoba.—Planted 1894. Growth very weak. Had some bloom but no fruit set.

CURRANTS.

Currants of all kinds were an excellent crop the past season.

In May thirty-seven varieties, including twenty-three cross-bred black sorts, were received from the Central Experimental Farm, Ottawa, and set out in the garden. All were living and had made a healthy growth when winter set in.

RED.

Fay's Prolific.—Ripe 23rd July; very large, bunches extra fine.
Red Dutch.—Ripe 20th July; fruit fair size, very productive.
Raby Castle.—Ripe 20th July; fruit fair size, very productive.
London Red.—Ripe 20th July; heavy crop, large fruit, extra.
Versillaise.—Ripe 20th July; medium fruit, large crop.
Knight's Early.—Ripe 20th July; small fruit, very heavy crop.
La Conde.—Ripe 20th July; medium crop and fruit.

WHITE.

White Grape.—Ripe 20th July; large fruit, very productive.
White Dutch.—Ripe 20th July; large fruit, very productive.
Transparent.—Ripe 20th July; large fruit, medium crop.

BLACK.

Lee's Prolific.—Ripe 26th July; extra good, ripens evenly.
Black Naples.—Ripe 26th July; large crop, uneven.
Prince of Wales.—Ripe 1st August; large, late, extra flavour.
Charmer.—Small fruit, fair crop.
Climax " "
Beauty " "
Dominion large fruit "
Topsy fair crop
Ontario "
Middlesex "
Parker "
Morden "
Native Black.—Ripe 1st August; large crop, small fruit.

The foliage of all the black varieties, except Prince of Wales, was very much damaged by rust, which somewhat affected the fruit.

RASPBERRIES.

Raspberries produced a most abundant crop of large and fine fruit the past season. The canes were uncovered on 6th May and were found to be in excellent condition

COVERED.

Reider—First ripe 20th July; heavy crop; extra fine large fruit.
Turner—First ripe 20th July; produced heaviest crop; fruit excellent.
Philadelphia—First ripe 25th July; some good fruit but uneven.
Cuthbert—First ripe 25th July; fair crop of fine berries.
Golden Queen—First ripe 10th August; late but extra fine.
Caroline—First ripe 1st August; large crop of extra fine fruit.

UNCOVERED.

Turner—First ripe 20th July. Not quite as good as those covered.
Cuthbert—First ripe 1st August. Not quite as good as those covered.
Hansell—First ripe 25th July. Not quite as good as those covered.
Caroline—First ripe 1st August. This was much better in both size and quality, than those which were covered.

BLACKBERRIES.

One bush each of Shaffer's Colossal and Early Ohio bore fruit the past season. The crop was small and the berries of medium quality.

GOOSEBERRIES.

The best crop of this fruit ever grown on the Farm was produced this year.

Smith' Improved and Houghton, well known varieties, gave excellent crops, and Columbus and Governess two newer sorts, were loaded with very fine fruit. Lancashire Lad also made a vigorous growth and produced some very large berries.

The native gooseberries were a good crop, but the berries were small. Their growth is so strong that it is almost impossible to keep them within reasonable bounds when under cultivation.

STRAWBERRIES.

An old plot of mixed Dominion and Captain Jack gave a small crop of small berries. Windsor Chief, Pineapple and New Dominion were a little better, The latter producing some very fair sized fruit.

Fifteen hundred young plants, of mixed varieties, have been rooted in a cold frame and are looking well. A new lot of six varieties received from Peter Henderson & Co., New York, were set out on 12th August, but are not doing well.

FOREST TREES.

In no year since the farm was started have trees of all sorts done better than during the season just past. Commencing to grow early in May and encountering no set-back they made and ripened a remarkable growth, the box-elder and the poplars had grown from four to five feet before the season was over. Hedges of maple, box-elder, willow and poplar which in other years could be kept trimmed without much trouble, were this year entirely out of reach.

Box-elder hedges on each side of the roads extending about one and one-half miles were set out last spring. Two year-old trees were used, and planted two feet apart. Every tree in the one and one-half miles grew, and will, no doubt, go through the winter in good condition.

One of the Russian poplars (Populus Bereolensis), is proving one of the best, if not the best variety of tree for avenues and lawns in the Territories. For shape and growth combined it has as yet no equal, and is only surpassed in growth by the American cottonwood. When all other trees were leafless this fall, Populus Bereolensis had its entire foliage. The American Cottonwood was also good in this respect but did not equal the Russian Poplar. Native sorts were all quite bare three weeks before a leaf fell from this variety.

In the spring of 1895, five one-half acre plots of trees were planted at different distances apart, for the purpose of ascertaining the cost of planting and keeping clean and in a thriving condition until the trees shade the ground sufficiently to prevent weeds from growing, and hence need no further cultivation. These trees were planted as follows :—plot No. 1, box-elder, set out 2½ feet apart each way ; plot No. 2, box-elder, planted 3 feet apart each way ; plot No. 3, box-elder, set out 3½ feet apart each way ; plot No. 4, box-elder, planted 4 feet apart each way, and plot No. 5, green ash, set out 2½ feet apart each way. In addition to this were plot No. 6, one-half acre, box-elder seed sown in rows 2½ feet apart, and plot No. 7, one-half acre, green ash seed sown in rows 2½ feet apart each way.

Following will be found the cost of planting and taking care of these trees for the first and second year :—

Plot No. 1—½ Acre.

1st year cost of planting,	15 hours	....	$2 25
" scruffling, &c.,	12 "	....	1 80
2nd year "	10 "	....	1 50
			$5 55

Plot No. 2—½ Acre.

1st year cost of planting,	12 hours	....	$1 80
" scruffling, &c.,	15 "	....	2 25
2nd year "	13 "	....	1 95
			$6 00

PLOT NO. 3—½ ACRE.

1st year cost of planting,	9 hours		$1 35
" scruffling, &c.,	11 "		1 65
2nd year "	12 "		1 80
			$4 80

PLOT NO. 4—½ ACRE.

1st year cost of planting,	9 hours		$1 35
" scruffling, &c.,	10 "		1 50
2nd year "	14 "		2 10
			$4 95

PLOT NO. 5—½ ACRE.

1st year cost of planting,	18 hours		$2 50
" scruffling, &c.,	11 "		1 65
2nd year "	9 "		1 35
			$5 50

PLOT NO. 6—½ ACRE.

1st year cost of making drills,	2 hours	$0 30
" " sowing seed,	4 "	0 60
" " covering seed,	6 "	0 90
" scruffling, &c.,	11½ "	1 72
2nd year "	10 "	1 50
		$5 02

PLOT NO. 7—½ ACRE.

1st year cost of making drills,	2 hours	$0 30
" " sowing seed,	4 "	0 60
" " covering seed,	6 "	0 90
" scruffling, &c.,	10½ "	1 57
2nd year "	9½ "	1 42
		$4 79

Taking up trees for five plots, 22½ hours.......... $3 38

HEDGES.

Lilac, (Syringa vulgaris), Honey Locust (Gleditschia triacanthos), and Native Poplar (Populus alba), were last spring added to the hedges planted in 1895, making in all eighteen hedges of different varieties of trees and shrubs.

Among those set out in 1895, Sharp leaved willow—(Salix acutifolia) Cottonwood—(Populus monilifera), Ginnalian Maple—(Acer Ginnala), Siberian Pea Tree—(Caragana arborescens), Russian Artemisia—(Artemisia Abrotanum var. Tobolskianum) and Box-elder, (Negundo aceroides), made the best growth.

The hedges around the gardens and other plots made a vigorous growth the past season. The hedge of sharp leaved willow, (Salix acutifolia), did extra well and is one of the best hedges on the farm.

Last spring, two Box-elder hedges had to be dug up as they were encroaching on more important trees. Next year several others, one of which is 14 feet high will for the same reason have to be similarly disposed of.

ARBORETUM.

The Arboretum started in the spring of 1895 received many additions during the past season, Forty-one varieties of trees and shrubs were set out in 1895 and sixty-five varieties the past spring, as follows :—

Acer dasycarpum.
" saccharinum.
" platanoides.
Abies Douglasii.
" balsamea (from Rat Portage).
" " (from Manitoba).
Alnus glutinosa.
" incana laciniata.
" viridis.
" imperialis laciniata.
Amelanchier alnifolia.
Berberis caricea.
" sinensis.
" Fischeri.
" laxiflora.
" macrophylla.
Betula pyramidalis.
" papyracea.
Cotoneaster vulgaris.
Crataegus Crus-galli.
" sanguinea Schroederi.
Cytisus capitatus.
Cornus stolonifera.
Caragana, mollis glabra.
" fruticosa.
" Redowskii.
" grandiflora.
" pygmaea.
Elaeagnus argentea.
" macrophylla.
" angustifolia (Russian.)
Euonymus (Russian).
Fraxinus americana.
Larix americana.
Lonicera tatarica. Tartarian Honey-suckle.
Ligustrum amurense.
Lonicera media.
Philadelphus grandiflora.
Prunus Maackii.
" grayana.
" virginiana.
Pyrus americana.
" Spuria.
Pinus Cembra.
" montana.
Populus Certinensis.
" betulifolia.
" Petrovsky.
" alba argentea.
" Nolesti.
" sibirica.
Picea alba.
Quercus pyramidalis.
Rhamnus Frangula.
Rosa rubrifolia livida.
Spiraea rotundifolia.
Salix laurifolia.
" britzensis.
Sambucus nigra, Improved Manitoba.
Rhus.
Syringa persica.
Thuja occidentalis.
Tilia americana.
Ulmus americana (Man.).
" " (Eastern.).
Viburnum Opulus.

SHRUBS.

The number of shrubs doing well on the farm is increasing each year. For several years Caragana arborescens, Siberian Pea Tree, was the only one that appeared able to stand the climate, but now the number is greatly increased by trees and shrubs that are proving to be equally as hardy as Caragana arborescens.

The past season the Lilacs, Common, Josikaea and Chinese were covered with bloom. Tartarian Honey-suckle and Lonicera Alberti were loaded down ; the latter being wonderfully fragrant. Spiraea opulifolia and the Barberries also made a good show. The Barberries after the first frost were beautiful.

Artemisia Abrotanum continues to give satisfaction as a hedge plant and wind-break. The past season the hedges were kept well trimmed and the seed not allowed to form, which proved a great advantage in keeping the plants green much later in the fall than usual, and in doing away with the risk of having seeds germinating all over the grounds. If the seed is allowed to mature, the hedge is unsightly until the new growth appears next spring. By trimming the hedge just before the seed is formed and again early in September, its appearance is greatly improved and continues so more especially during

the winter months. Trimming does not impair its usefulness as a snow catcher or wind-break.

The following shrubs were received from the Central Experimental Farm, Ottawa, and planted in May last:—

Name of Variety.	No. planted.	No. Living.	No. Dead.	Name of Variety.	No. Planted.	No. Living.	No. Dead.
Crataegus torminalis	3	0	3	Sambucus pulverulenta alba	3	3	
Acer monspessulanum	3	2	1	Alnus cordata	3	1	2
Cornus sibirica variegata	2	2		Sambucus heterophyllus	2	2	
Sambucus pendula	2	1	1	Sambucus laciniata	3	3	
Syringa purpurea	3	3		Rhamnus catharticus	3	3	
Ptelea trifoliata aurea	3	2	1	Hydrangea paniculata grandiflora	4	4	
Syringa Emodi variegata	2	1	1	Diervilla lutea	4	4	
Cytisus trifolius	3	3		Spiraea callosa rosea	3	3	
" hirsutus	3	2	1	Syringa villosa	4	4	
Sorbus domestica	3	3		Sambucus variegata aurea	3	3	
Sambucus variegata argentea	3	3		Rhus coriaria	3	3	
Staphylea pinnata	2	0	2	Syringa Josikaea	14	14	
Berberis laxiflora	3	3		Sambucus aurea nova	7	7	
Sambucus nigra	3	3		Ribes Gordonianum	3	3	
" canadensis	3	3		Populus Bolleana	4	4	
Quercus pyramidalis	3	0	3	Betula pendula Youngii	1	1	
Alnus viridis	1	1		Alnus incana laciniata	2	2	
Alnus Imperialis laciniata	1	1		Acer Ginnala	5	5	
Philadelphus inodorus	3	3		Spiraea Van Houttei	4	4	
" grandiflorus	1	1		Cornus sanguinea	3	3	
Sambucus aurea nova	6	6		Viburnum Opulus	6	6	
Hypericum calycinum	4	0	4	Thuya sibirica	1	0	1
Viburnum Lantana	3	3		Thuya occid lutea	2	2	
Salisburia adiantifolia	2	0	2	Thuya occid Hoveyii	2	2	
Philadelphus coronarius	3	3		Thuya occid Elwangeriana	1	1	
Diervilla Sieboldii	2	2		Juniperus Sabina	2	2	
Philadelphus deutziflorus	5	5		Pinus ponderosa	11	7	4

LIVE STOCK.

CATTLE.

The herd on the farm is in a healthy and thriving condition and consists of thirty-five head, as follows:

Shorthorns—4 females, 1 two year old bull, and 2 bull calves.

Holsteins—9 females, 1 three year old bull, and 2 bull calves.

Polled Angus—1 female.

Grades—7 females and 8 steers.

During the summer three young Holstein bulls were sold to farmers and the four bull calves above mentioned will soon be available for the same purpose.

Last spring a butter factory was started at Indian Head and operated by Professor Robertson, Dairy Commissioner for the Dominion Government, and gave good satisfaction to the patrons. When the factory commenced work, milk from the cows on the farm was sent. On account, however, of the small supply available from other sources, the factory discontinued receiving milk, and as we had no separator on the farm the milk was fed to the calves.

During last winter tests were made in feeding different rations, consisting of, 1st, hay and cut straw; 2nd, ensilage and cut straw; 3rd, ensilage and cut oat sheaves; 4th, ensilage, hay and cut straw, and 5th, cut oat sheaves and cut straw. To each of the animals fed on the above was given the same ration of meal and roots.

The ensilage was made from Indian corn; the meal was wheat screenings mixed with barley and ground; oat or barley straw was used and the hay was fed whole. The cut straw was mixed with ensilage or cut oat sheaves and the meal added.

Two animals were in each lot and from November 26th to April 26th, with two weeks' preparatory feeding, were fed three times a day.

Lot No. 1—Consisting of two three year old steers, was fed hay, 15 pounds, straw, 5 pounds, meal, 5 pounds, and turnips, 20 pounds.

Lot No. 2—Consisting of two three year old steers, was fed ensilage 30 pounds, straw, 10 pounds, meal, 5 pounds, and turnips, 20 pounds.

Lot No. 3—Consisting of two two year old steers, was fed cut oat sheaves, 15 pounds, ensilage, 20 pounds, meal 5 pounds, and turnips, 20 pounds.

Lot No. 4, consisting of two cows, was fed ensilage 20 pounds, hay 8 pounds, straw 10 pounds, meal 5 pounds and turnips 20 pounds.

Lot No. 5, consisting of a bull and a steer, each 2 years old, was fed cut oat sheaves 15 pounds, straw 5 pounds, meal 5 pounds, and turnips 20 pounds.

Lot.	Weight at Commencement of Test.	Weight at Close of Test.	Total Gain.	Average Gain per Month.
	Lbs.	Lbs.	Lbs.	Lbs.
No. 1	2,175	2,730	555	111
No. 2	2,510	2,990	480	96
No. 3	1,985	2,465	480	96
No. 4	2,380	2,827	447	89⅖
No. 5	1,950	2,320	370	92½

NOTE.—Lot No. 5 was fed for four months instead of five.

EXPERIMENTS WITH SWINE.

At present there are on the farm three pure breeds of swine—Large Yorkskire, Tamworth and Berkshire; also some cross-bred pigs from a Berkshire sow and Tamworth boar.

During last winter the old Berkshire boar "Derby" died, and his place has been filled by a young animal, "Black Prince," received from James Elder, Esq., Virden, Manitoba.

Berkshire crossed with Tamworth seems to be a good cross for the North-west Territories, and Tamworth boars for this purpose are in good demand. The cross is rather larger than the Berkshire, and more compact than the Tamworth. They are good feeders, and mature quickly, two very good points in their favour.

To test the difference in growth between Large Yorkshires, Tamworths and cross-bred pigs, two animals from each of these breeds were put into one pen on 4th August, and fed all they would eat till 24th November, or in all 111 days.

The age and weight of each lot at the commencement and weight at close of the test, will be found below, together with the amount of gain, which shows slightly in favour of the Tamworth breed. No Berkshires were available at the time, or they would have been added to the test.

Breed.	Age.		Weight at Start of Test.	Weight at Close of Test.	Gain.
	Months.	Days.	Lbs.	Lbs.	Lbs.
Large Yorkshire	4	8	124	404	280
Tamworth	3	27	141	456	315
Cross-bred	2	26	96	400	304

EXPERIMENTS WITH POULTRY.

Four breeds of poultry are kept, Plymouth Rocks, White Leghorns, White Wyandottes and Black Minorcas. In March last there were 8 Plymouth Rock hens, 10 White Wyandottes, 12 White Leghorns and 14 Black Minorcas. These were placed in separate breeding pens early in March, and during the months of March, April, May and June produced eggs as follows:—

Breed.	March.	April.	May.	June.	Total.
Plymouth Rock	30	40	71	74	215
White Wyandottes	17	54	102	102	275
White Leghorns	38	69	96	162	365
Black Minorcas	20	69	120	140	449

Early in July the hens were allowed to go together, after which no separate account of the eggs laid could be kept.

One hundred and thirty-nine eggs were set, from which eighty-four chickens were hatched. The May and early June chickens have done well, while those hatched later are still very small and of very little use.

The following are in good condition:—

	Hens	Pullets.	Cockerels.
Plymouth Rocks	4	7	6
White Wyandottes	9	4	2
White Leghorns	9	5	4
Black Minorcas	11	2	3

One very fine cockerel of each of the above breeds, not related to the present stock, has been lately received from the Central Experimental Farm, Ottawa.

The rations fed to sixty-one fowls during February and March last were:—

FEBRUARY.

Bran, 38 lbs at ½c	$ 19
Chop, 37 lbs at ¾c	28
Wheat, 165 lbs at ¾c	1 24
Oats, 48 lbs at ¾c	36
Beefheads, 1½ at 25c. each	37½
Total	$2 44½

MARCH.

Bran, 40 lbs at ½c	$ 20
Chop, 32 lbs at ¾c	24
Wheat, 120 lbs at ¾c	90
Oats, 80 lbs at ¾c	60
Beefheads, 2½ at 25c. each	62½
Total	$2 56½

BEES.

In May last, one hive of thoroughbred Italian bees was received from W. B. Holmes, Esq., Athens, Ont. The bees arrived in excellent condition and proved to be an extra fine hive of well-marked Italians.

They were allowed their liberty on day of arrival and at once commenced working on the late blossoms of fruit bushes, being too late for the early and best crop of bloom.

In July the bees were preparing to swarm, when it was thought better to divide the swarm, which was successfully done. In August the original hive sent out a second swarm which was secured without trouble.

Early in November on finding the late swarm very short of honey, all the frames and bees were transferred to the parent hive which was short of bees but had sufficient honey for the united swarms. When this was done the two hives were placed in an upper room of the hennery and packed in chaff for the winter.

DISTRIBUTION OF SAMPLES OF GRAIN, POTATOES, FOREST TREES, &c.

During the months of March, April and May, the following distribution was made of products all of which were grown on the farms of applicants throughout Assiniboia, Alberta and Saskatchewan.

Samples Distributed.	Number.	Total.
Wheat, 3 lb. bags	267	
Oats, 3 lb. bags	448	
Barley, 3 lb. bags	342	
Pease, 3 lb. bags	93	
Rye, 3 lb. bags	25	
Flax, 3 lb. bags	12	
Beans, 1 lb. bag	1	
Garden pease, 1 lb. bags	39	
Corn, 1 lb. bags	3	
		1,230
Forest trees—		
Artemisia Abrotanum, Tob. (cuttings)	8,756	
Caragana arborescens (seedlings)	2,934	
Willows (cuttings)	1,850	
Poplars "	1,165	
Maple (box elder) seedlings	3,060	
Lilac (seedlings)	100	
Ash "	190	
		18,055
Fruit bushes and cuttings—		
Raspberries	2,380	
Currants	5,653	
Gooseberries	160	
Plums (seedlings)	90	
		8,283
Garden seeds (packages)	37	37
Potatoes, 3 lb. bags	463	463
Bromus inermis grass seed (1 lb. bags)	643	643
Rhubarb roots	90	90
Asparagus roots	2,000	2,000

Summary of Distribution.	Bags and Packages.	Seedlings, Roots and Cuttings.
Grain	1,230	
Forest trees		18,055
Fruit bushes		8,283
Garden seeds	37	
Potatoes	463	
Bromus inermis grass seed	643	
Rhubarb roots		90
Asparagus roots		2,000
Totals	2,373	28,428

HOPS.

A test has been made during the past two years in the cultivation of hops.

Although hops grow wild in the coulees or ravines in many parts of the Territories they mature only once in, possibly, two or three years on account of early frosts. It was, therefore, thought advisable to test two of the best cultivated varieties alongside of the native sort.

Roots of cultivated varieties were obtained from growers in Washington Territory, U.S.A., and from Agassiz, British Columbia, both of which places produce excellent crops of hops.

The above, together with the roots of the native variety found in a couleé near the farm, were planted 8 feet apart, in one of the hedged inclosures, in the spring of 1894. About one-half of the roots planted lived, and made, in some cases, a few feet of growth that season.

In 1895 the spring opened early, and by the middle of May considerable growth had been made by these vines, when a severe frost cut everything back to the ground, and the new growth did not mature hops before the frosts came in that fall.

The season just passed has been a very favourable one, and on most of the vines a heavy crop was produced.

The hops received from British Columbia were ten days earlier than the Washington Territory variety. The hops were picked on September 9th.

Roots from British Columbia—Fine crop, well matured, fair sized hops.

Roots from Washington Territory—Heaviest crop, but did not mature well; ten days later than British Columbia variety.

Native variety—Earlier than either cultivated variety; larger hops of a stronger flavour; fair crop.

ENSILAGE.

Corn ensilage made in the season of 1895 kept in splendid condition, the last being used in June of the present year.

The ensilage made from grain, chiefly oats and barley, cut green, was not very satisfactory on account of its drying out before the bottom of the silo was reached, so long as there was a good body of ensilage it kept moist and in good condition, but as the quantity in the silo decreased, in April, the ensilage dried out and lost much of its feeding value and became no better than ordinary straw.

The past season ten acres of corn were grown and have been put in the two silos. The varieties of corn used were North Dakota and Mitchell's Extra Early, both of which were well advanced when cut, and never before have we had so much or so good ensilage. At present all the cattle are being fed on the ensilage, mixed with wheat chaff, which makes a splendid ration.

On account of lack of room in the silos and the poor success hitherto attained, no grain was made into ensilage this season.

IMPROVEMENTS.

During the past season the roads on the east side of the farm were planted on either side with two year old box-elder trees. The trees were set out 2 feet apart to form a hedge for protection from wind as well as for avenue purposes. Between $1\frac{1}{4}$ and $1\frac{1}{2}$ miles were completed, leaving about $1\frac{1}{2}$ miles yet to do, when the margins of all the roads on the farm will be planted with trees of different sorts.

Further additions were made during the spring and fall to the several dams, thereby increasing the depth of water. New sluice-ways were also put in as a safeguard against spring freshets.

WATER SUPPLY.

The farm was well supplied with water during the past season. The three reservoirs, with an area of 10 to 12 acres, are still well filled, and with the large quantity of snow already on the ground, the prospect for an abundant supply next year is good.

MEETINGS ATTENDED.

During last winter and early spring I attended farmers' meetings in Moosejaw, Grenfell, and Wolseley, giving addresses on the work of the farm. I also attended, in company with the president and vice-president of the Dairymen's Association of the North-west Territories, meetings at Fort Qu'Appelle, Whitewood, Broadview, Grenfell, Wolseley, Indian Head, and Qu'Appelle Station.

CORRESPONDENCE.

During the twelve months ending October 31st, 1896, 2,937 letters were received and 3,263 mailed from this office. In letters received, reports on grain and other samples are not counted and in letters dispatched, circulars of instruction *re* grain and other samples distributed are not included.

EXHIBITIONS ATTENDED.

Products of the farm were shown at the fall fairs held at Qu'Appelle Station, Fort Qu'Appelle and Indian Head. The Wolseley fair was attended but no exhibit was made there.

VISITORS.

Visitors to the farm were numerous the past season.

On 13th July, a body of Orangemen to the number of several hundred from various points in Eastern Assiniboia visited the farm.

On 28th August, an excursion party from Moosejaw and intermediate points, spent three hours on the farm, inspecting the various points of interest.

METEOROLOGICAL OBSERVATIONS.

Temperature, maximum and minimum, for twelve months; average temperature for growing season; also range of temperature, sunshine, rainfall and direction of wind for growing season.

Location.—Longitude, 102° west; latitude, 52° north; altitude, about 2,000 feet.

TEMPERATURE.—Maximum and minimum for 12 months ending November 30th, 1896.

Month.	Maximum.		Minimum.	
	Degrees.	Date.	Degrees.	Date.
1895.				
December	46	12	—22	25
1896.				
January	42	7	—35	3
February	47	23	—30	13
March	47	24	—20	12
April	68	26	8	12
May	75	23	20	1
June	92	30	40	6
July	94	10	35	26
August	90	1	31.5	16
September	82	23	24	10
October	80	2	4	31
November	34	4	—38	19

AVERAGE TEMPERATURE for Growing Season, April 1st to September 10th.

Month.	Monthly Average.	
April	35	Daily average, 53°·7
May	52	
June	61	
July	65	
August	59	
September, 1st to 10th	44	

RANGE OF TEMPERATURE for Growing Season, April 1st to September 10th.

Month.	Date.	Greatest daily range.		Degrees.	Average Monthly Range.
		From	To		
April	25	65°	32°	33°	18°
May	1	64	20	44	26
June	30	92	55	37	25
July	9	89	49	40	25
August	1	90	51	39	26
September, 1st to 10th	3	75	32	43	26

Average daily range (season) 24°·13.

SUNSHINE—Hours of bright sunshine from 1st April to 10th September, and number of days in which there was no sunshine.

Month.	Hours.	No sunshine. — No. of days.
April	143·8	10
May	159·1	7
June	249·9	3
July	269·5	2
August	237·8	5
September 1st to 10th	42·5	1
	1,102·6	28

RAINFALL—From 1st April to 10th September, 1896.

Month.	No. of days.	Inches.
April	1	·15
May	7	2·83
June	8	4·32
July	5	1·9
August	5	1·39
September 1st to 10th	0	0·
	26	10·59

NOTE.—On April 15th and 18th, snow fell to a depth of 16 inches.

WIND.

DIRECTION—Three observations each day, at 8, 14 and 20 o'clock.—Times observed.

Month.	W.	N. W.	N.	N. E.	E.	S. E.	S.	S. W.
April	5	28	9	13	4	14	14	3
May	22	30	2	5	12	7	12	3
June	14	30	4	8	9	8	14	3
July	14	37	11	8	4	7	10	2
August	21	49	5	6	6	0	6	0
September 1st to 10th	1	15	5	3	1	0	1	4
	77	189	36	43	36	36	57	15

I have the honour to remain, sir,

Your obedient servant,

ANGUS MACKAY,
Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., 30th November, 1896.

To DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my report of progress made, and work done on the farm at Agassiz, during the past year.

The first two months of the year were normal winter for this climate, the coldest day being 16th January, when the temperature dropped to 9°. March opened with cold north, and north-west winds prevailing until the 10th, when a mild spell, with westerly winds set in, and continued for about a week, and the snow melted. The wind then changed to the north, accompanied with cold showers which continued during April, and until the latter part of May, when it became warmer. With the beginning of June, dry hot weather set in, and the summer of 1896 has been the driest we have experienced since the farm has been established.

The cold rains during the blossoming season had a very damaging effect on the fruit crops, for although every variety of fruit tree and plant was full of bloom, the fruit crop has been a light one.

The cold winds of December, January and February did not injure tender evergreens, nearly as much as in previous years, and it is to be hoped that as they become older they will not be so readily affected in this way, as they are when young.

About six acres of additional land has been cleared and brought under cultivation this year, and a considerable amount of grubbing, and brushing done towards adding another ten acres to the cultivated area.

HEDGES.

The hedges have all made a strong growth this year, and those of an ornamental character, have been very much admired by visitors to the Experimental Farm, and an increasing interest is being shown by all classes of visitors, in both the hedges and ornamental shrubs, and as soon as times mend a considerable amount of such material will doubtless be planted throughout the country.

BELTS OF FOREST TREES.

The forest belt has grown so much, that it completely shades the ground, and the land in the belt has been sown with grass.

The forest trees planted on the mountain, have made fair progress, but as they receive no attention, will not make nearly so vigorous a growth as the trees in the shelter belt at least until they have grown well above the ferns and underbrush.

Notwithstanding the unfavourable season, there has been a very fine display of bloom, since early spring, and up to the first of November, and owing to the dry, fine weather, the autumn tints of the leaves have been very beautiful.

As in previous seasons a considerable number of 3 lb. bags of grain and potatoes, have been distributed, as also, several thousand berry plants.

Of the forms which were sent out with the grain and potatoes, and have been filled in and returned, a great many report short crops, on account of drought.

The berry plants distributed in 1895 appear, in nearly every case, to have wintered well, and gave promise of good crops of fruit this year, when reported on last spring.

A number of exhibitions were attended this fall, but owing to the strike on the Canadian Pacific Railway exhibits were inconveniently delayed.

The number of visitors to the Experimental Farm is increasing.

There was an excursion from Chilliwhack, on July 2nd, to the farm, and one from the coast and Island Cities, on August 8th being the Vancouver World's staff's annual holiday, combined with the British Columbia Fruit Grower's Association,—together numbering over 1,000 persons.

Short addresses were made by Messrs. J. C. McLagan, editor of the Vancouver World, Wm. Templeman, editor of the Victoria Times, T. G. Earl, president of the Fruit Growers' Association, J. R. Anderson, Provincial Deputy Minister of Agriculture, the Superintendent of the Farm and several others, and every one appeared to enjoy the pleasant day, and it is to be hoped that the Vancouver World and other newspapers will organize similar excursions in future years, for in this way cheaper transportation is obtained, and many take advantage of that, to visit the Experimental Farm, who would not otherwise come.

A colony of Italian bees was received in June, and early in July a swarm came off. These were hived, and they at once started to work. The bees will no doubt be a valuable aid in assisting the pollinization of fruit blossoms in the orchard.

As in previous years, I have to acknowledge with thanks many kindly references to our work in the press of the province, also the receipt of scions of fruit and trees, plants and seeds.

Prof. Shinn of Berkely, Cal., sent scions of a large number of fruit trees.

Prof. E. J. Wickson of the same institution, plants and seeds of Australian Salt Bush (a fodder plant for alkali land.)

Mr. Swann of Olympia, Wash., scions of several new apples, and two varieties of seedling plums.

Rev. Father Cornellier of Okanagan Mission, scions of apples.

Mr. Heatherbell of Hornby Island, scions of apples.

Mr. McEwen of Langley, British Columbia, scions of apples.

Mr. Toms, of Combe Mark Rectory, Devonshire, England, scions of six varieties of apples.

Mr. Hutcherson, Ladners, scions of a new seedling pear.

Mr. G. W. Beebe, Agassiz, three varieties of seedling strawberries.

Mr. Wm. Walker of Salem, Oregon, two varieties of seedling apples and one of cherries.

Messrs. McGill and McDonald, of Salem, Oregon, four varieties of apples and one of cherries.

I have the honour to be sir,

Your obedient servant,

THOS. A. SHARPE.

EXPERIMENTS WITH FALL WHEAT.

Thirty-two varieties were included in these tests, all sown on the 24th of September, 1895, on a rather exposed piece or light sandy loam. The plots all suffered from the cold winds in December and January, blowing the light top soil off and exposing the roots which very seriously injured many of them.

Fall wheat here has frequently suffered from this cause, but this crop had been sown early, and when winter came the growth had pretty nearly covered the ground, and it was hoped that the plants would not be thus injured again, but the results have not been satisfactory. None of the varieties suffered from rust. The seed had been treated with blue stone, and there was very little smut.

FALL WHEAT—Test of Varieties.

Name of Variety.	Date of Ripening.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.	
		Inches.		Inches.		Lbs.	Bus.	Lbs.
Royal Prize Red	Aug. 4	48 to 54	Weak	3 to 3½	Beardless	2,800	19	40
Square Head	" 4	42 to 44	Medium	2 to 2½	"	3,400	18	..
Carter's E	July 27	44 to 48	Stiff	3 to 3½	"	4,600	17	..
Portland	" 27	33 to 36	"	3½ to 4	"	3,900	16	40
Tasmanian	" 22	48 to 50	Medium	3 to 3½	Bearded	3,800	16	40
Carter's D	Aug. 4	36 to 40	Stiff	3 to 3½	Beardless	2,800	16	35
Carter's F	July 27	36 to 40	"	3½ to 4½	"	4,600	16	35
Cheam	" 27	40 to 44	"	3 to 4	"	3,200	15	40
Hungarian	" 22	42 to 45	Weak	3 to 3½	Bearded	3,300	15	40
Martin's Amber	" 24	44 to 50	"	3 to 3½	Beardless	2,400	15	28
White Queen	Aug. 4	44 to 50	Stiff	3 to 4	"	2,600	15	20
Johnson	July 27	46 to 52	"	3½ to 4	Bearded	4,200	15	10
Fill Measure	Aug. 4	42 to 48	Fair	3 to 3½	Beardless	2,820	15	5
Martin	July 22	44 to 48	Stiff	3 to 3½	Bearded	3,240	15	..
Lytton	" 23	38 to 40	"	3½ to 4	Slightly bearded.	3,200	15	..
Carter's A	Aug. 4	44 to 46	"	2 to 2½	Beardless	2,200	15	..
Carter's G	" 4	36 to 40	"	2½ to 3	"	2,400	15	..
Carter's J	" 4	40 to 45	"	3 to 3½	"	2,450	15	..
Carter's H	" 4	55 to 60	Soft	2½ to 3	"	2,900	14	40
Democrat	July 22	44 to 48	Stiff	3 to 3½	Bearded	3,600	14	20
Yale	" 24	48 to 50	"	3½ to 4	Slightly bearded.	3,800	14	20
Hope	" 22	44 to 50	"	3 to 3½	Bearded	3,200	14	10
Volunteer	" 22	44 to 48	"	3 to 3½	"	3,400	14	..
Early Red Clawson	" 22	42 to 48	Medium	3 to 3½	Beardless	2,850	14	..
Stuart	" 22	40 to 45	Stiff	2½ to 3	"	3,220	13	10
Canadian Velvet Chaff	" 22	48 to 50	"	3½ to 4	"	2,200	13	10
Carter's K	Aug. 4	40 to 42	"	2 to 2½	"	1,800	13	..
Carter's C	" 4	44 to 48	Weak	3 to 4	"	1,600	12	40
Willits	July 23	46 to 50	Stiff	2½ to 3	"	2,700	12	40
Golden Cross	" 22	42 to 46	Weak	2½ to 3	Bearded	3,300	11	20
Carter's B	Aug. 4	46 to 48	Stiff	2 to 2½	Beardless	1,600	9	20
Manchester	July 23	32 to 36	Weak	2½ to 3	"	2,100	7	30

Six of the varieties included in this test are cross-bred wheats which have been originated at Agassiz by the superintendent of the farm. The following are their names and parentage :—

Portland–Johnson female with Gehun male, beardless.
Cheam–Johnson " " beardless.
Martin–Manchester " Democrat male, red chaff, bearded.
Lytton–Manchester " " " slightly bearded.
Yale–Manchester " " white chaff, slightly bearded.
Hope–Manchester " " " bearded.

HYBRID WHEATS.

The following hybrids produced at the Agassiz Experimental Farm by the superintendent were sown on small plots, No. 1 occupied 132 square yards and No. 2, 44 square yards. They were sown on 24th September, 1895, and ripened on 22nd and 23rd of July, 1896. No. 1 is slightly bearded at tip and No. 2 bearded.

Name of Variety.	Date of Sowing.	Yield per Acre.		Remarks.
	1895.	Bush.	Lbs.	
No. 1, Early Red Clawson with Reading Giant, Rye.....	Sept. 24..	33	..	No rust ; no smut.
No. 2 " " "	" 24..	27	30	" "

SPRING WHEAT.

Thirty-eight varieties of spring wheat were tested this year in plots of $\frac{1}{20}$ acre each on the 18th of April. The yield is in most cases very fair, when the unfavourable season is considered. The land was loamy, had been cropped for a number of years and seeded with clover in 1894, and a heavy clover stubble turned under for the wheat crop this year, which, no doubt, helped the crop out, notwithstanding the very dry summer. None of these varieties were affected either by rust or smut.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
Dawn................	Aug. 5..	109	40 to 44	Stiff........	3½ to 4½	Beardless.	4,600	30	..	63¾
Preston...	" 7..	111	38 to 42	"	3 to 3½	Bearded..	4,100	29	40	64
Herrison Bearded.....	" 15..	119	44 to 48	Fair........	2¾ to 3½	" ..	4,400	29	20	64¾
Emporium.	" 11..	115	46 to 50	Weak	3½ to 4	" ..	3,900	28	20	64½
White Connell........	" 15..	119	36 to 40	Stiff	2½ to 3	Beardless.	3,500	28	20	62¾
Red Fern.............	" 7.	111	40 to 44	Weak	3½ to 4	Bearded..	4,100	27	40	64¼
Old Red River......	" 15..	119	43 to 46	Stiff	2¾ to 3½	Beardless.	3,800	27	20	62½
Campbell's White Chaff	" 11..	115	50 to 54	"	2½ to 3½	" ..	3,600	26	10	62¾
White Russian.......	" 15..	119	46 to 50	"	2¾ to 3¼	" ..	3,640	25	30	
Dufferin.............	" 5..	109	40 to 44	"	2½ to 3	Bearded..	3,700	25	—	64
Wellman's Fife.......	" 15.	119	42 to 46	"	3 to 3½	Beardless.	3,600	25	—	61¼
Countess.	" 7..	111	44 to 46	"	2½ to 3	" ..	3,200	24	—	65
Crown...............	" 11..	115	52 to 56	"	3 to 3¼	Bearded..	3,900	23	40	63¼
Monarch..............	" 11..	115	46 to 50	"	3½ to 4	Beardless.	3,420	23	40	61½
Red Fife.......... .	" 10..	114	36 to 42	"	3 to 4	" ..	3,000	23	20	61½
Colorado.......	" 7..	111	36 to 40	Fair.......	3 to 3½	Bearded..	3,300	23	20	
Ladoga..............	" 5..	109	34 to 38	Stiff.......	2½ to 3	" ..	3,200	23	20	63¾
Pringle's Champlain..	" 11..	115	46 to 50	Fair	3 to 4	" ..	3,160	23	20	64½
Alpha................	" 7..	111	44 to 48	Stiff	3½ to 3¾	Beardless.	3,000	23	—	62½
Blenheim.............	" 11..	115	52 to 56	Fair	3½ to 4	Bearded..	3,140	22	10	62¾
Admiral	" 15	119	46 to 48	Stiff.......	4 to 4½	Beardless.	3,200	22	—	62
Stanley.	" 5..	109	38 to 42	"	3 to 3½	" ..	3,240	22	40	60¼
Goose...............	" 11..	115	36 to 39	Fair........	2 to 2¼	Bearded..	2,800	21	20	63½
Percy................	" 5..	109	44 to 48	Stiff.......	2½ to 3½	Beardless.	3,020	20	20	62¾
Vernon	" 11..	115	38 to 42	"	3 to 3¼	Bearded..	2,600	20	—	64
White Fife...........	" 7..	111	44 to 48	"	2¾ to 3¼	Beardless.	2,700	19	40	61¾
Rideau.	" 10..	114	50 to 55	"	2½ to 3	"	2,640	19	20	61½
Captor..............	" 6..	110	46 to 50	"	3 to 3½	"	2,800	19	20	63
Dion's...............	" 9 .	113	42 to 46	"	3½ to 4	Bearded..	2,620	19	10	64¼
Beaudry	" 8..	112	44 to 46	Fair.......	2¾ to 3¾	" ..	3,100	19	10	64½
Advance..............	" 10..	114	46 to 48	Stiff.......	2½ to 3	" ..	2,620	19	—	63½
Huron.	" 11..	115	42 to 45	Fair.......	3½ to 4	" ..	2,900	18	40	64
Gehun...............	" 6..	110	32 to 36	Stiff.......	3 to 3¼	Beardless.	2,260	18	20	65¾
Golden Drop.........	" 7..	111	40 to 42	"	3 to 3½	" ...	2,300	18	10	63¾
Black Sea...........	" 6..	110	38 to 44	Weak.......	2½ to 3	Bearded.	2,340	18	00	
Progress............	" 11..	115	48 to 52	Stiff.......	3 to 3½	Beardless.	2,800	17	–	60¾
Beauty	" 10..	114	46 to 50	"	2 to 2½	"	2,660	16	40	63
Rio Grande..........	" 10..	114	36 to 39	Fair.......	3 to 3½	Bearded..	2,280	16	40	61½

OATS.

Sixty-five varieties of oats were included in this series, all sown on loamy soil on the 15th April, on plots of $\frac{1}{20}$ of an acre each. The yield has been light owing to the drought, but the sample is good, and having had dry, favourable weather, it was all harvested in good condition. There was no rust on the straw this season, and as the seed had been treated with blue stone, and the land was new, there was scarcely any smut.

OATS—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs
Early Gothland	Aug. 12	119	45	Stiff	10	Sided	4,800	61	26	39
Early Golden Prolific	" 21	128	47	Weak	9	Branching	5,600	61	20	36½
Bavarian	" 13	120	54	Stiff	9	"	5,520	58	08	36
Columbus	" 13	120	46	"	8	"	5,940	57	02	35¾
White Schonen	" 6	113	42	"	7	"	3,900	55	30	
Electric	" 13	120	44	"	7	"	4,400	55	30	37½
Buckbee's Illinois	" 21	128	54	Medium	10	"	6,100	55	30	36¾
Cromwell	" 12	119	50	Stiff	11	"	5,500	55	10	39
Oderbruch	" 16	123	43	Medium	7	Half sided	4,600	55	10	36
Banner	" 15	122	50	Stiff	8	Branching	4,400	54	24	25
Early Etampes	" 12	119	42	Fair	7½	"	5,080	54	24	34¾
Cave	" 11	118	48	"	7½	Sided	4,680	53	18	38
Holstein Prolific	" 13	120	42	Stiff	6	Branching	4,400	53	18	36
Master	" 13	120	46	"	9	"	4,800	52	32	39¼
Wallis	" 12	119	40	"	6½	"	4,700	51	26	36¼
Doncaster	" 13	120	45	"	7½	"	5,900	51	11	40½
Bonanza	" 5	112	45	Medium	8	"	4,100	51	8	37¾
Mennonite	" 16	123	40	Stiff	6½	"	5,000	50	25	37¾
American Beauty	" 20	127	50	"	9	"	4,000	50	20	37¼
Early Archangel	" 13	120	46	Medium	7½	"	4,940	50	20	40¼
Improved Ligowo	" 13	120	40	Stiff	6½	"	4,600	50	20	37¼
Abyssinian	" 15	122	45	"	7½	Sided	4,200	50	10	36¾
Welcome	" 9	115	44	Medium	6½	Branching	3,600	50	5	36¼
American Triumph	" 20	127	58	"	7½	"	5,200	48	8	
Early Blossom	" 12	119	44	"	8	Half sided	4,500	48	3	38
Wide Awake	" 6	112	34	Stiff	5½	Branching	2,000	47	27	36½
Lincoln	" 20	127	39	Medium	6½	"	5,400	47	7	38
Early Maine	" 16	123	43	"	6	Sided	3,500	47	2	36½
Black Brie	" 21	128	44	Stiff	8	Branching	5,980	47	2	37¼
Winter Grey	July 31	107	40	"	6	"	3,700	46	30	41
White Russian	Aug. 12	119	40	"	6	Half sided	3,500	46	16	38
Olive (Black)	" 6	113	46	"	6	"	4,100	46	16	37½
Brandon	" 21	128	55	"	9½	Branching	5,200	46	6	39¼
Giant Cluster	" 12	119	40	Medium	7½	Sided	4,700	45	30	32¼
Hazlett's Seizure	" 13	120	44	Fair	7½	Branching	4,000	45	10	39½
California Prolific (Black)	" 20	127	40	"	8	Sided	5,300	44	24	34¼
Coulommier's	" 21	128	48	Stiff	7	Branching	5,600	44	14	36
Cream Egyptian	" 25	122	44	Medium	7	Half sided	5,300	44	09	39
Golden Beauty	" 13	120	40	"	6½	Branching	4,200	44	09	35½
Scottish Chief	" 6	113	44	Stiff	6	"	3,620	44	04	41
Pense (Black)	" 16	123	46	"	5	"	4,800	42	32	38½
White Monarch	" 12	119	36	"	7½	"	3,300	42	32	38¾
Flying Scotchman	" 13	120	44	"	7	"	5,000	42	12	40
Rosedale	" 12	119	42	"	6	Half sided	4,000	42	12	36¼
Russell	" 12	119	46	Fair	9	Branching	3,740	41	13	39½
Prolific Black Tartarian	" 16	123	40	Stiff	6	Sided	4,000	41	13	34¾
Victoria Prize	" 6	113	44	"	6	Branching	3,620	41	08	44¼
Medal	" 21	128	43	"	8	"	4,200	41	08	38½
Oxford	" 16	123	44	Medium	5½	"	3,900	40	26	37¼
Imported Irish	" 5	112	38	Stiff	6	"	3,700	40	10	42¼
Scotch Hopetown	" 16	123	40	"	6½	"	3,700	40		35½
Abundance	" 5	112	36	"	7	"	3,300	40	00	35¾
Siberian	" 21	128	44	Weak	7½	Half sided	4,840	39	14	34¾
Miller	" 21	128	34	Stiff	7	Branching	4,100	38	28	37½

OATS—Test of Varieties—*Continued.*

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs
Prize Cluster	Aug. 16	123	40	Stiff	5½	Branching	4,200	38	28	40¾
White Wonder	" 6	113	44	"	6	"	3,600	38	14	43
White Poland	" 12	119	44	"	5	"	3,800	37	22	38¾
Rennie's Prize	" 12	119	42	"	5½	"	3,200	37	07	39
Joanette	" 12	119	33	"	6	"	3,500	34	09	37
King	" 20	127	34	"	5	"	3,600	31	26	38
Pearce's Black Beauty	" 16	123	32	"	5	"	2,000	25	30	35¼

EXPERIMENTS WITH BARLEY.

Thirty-nine varieties of barley have been tested in uniform plots of one-twentieth of an acre each, twenty of which were two-rowed barley and nineteen, six-rowed. The soil was loamy, with more or less gravel. All the plots were sown on the 20th of April. This series of tests was made between the rows of trees in the apple orchard, which was planted in the spring of 1890, and although a strip of seven feet on each side of the trees was left unsown, yet the crop was partially shaded, which to some extent reduced the yield. As all were alike in this respect, the comparative results are yet fairly reliable. No injury was done by rust or smut.

BARLEY, TWO-ROWED—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
French Chevalier	Aug. 10	112	38 to 40	Stiff	4 to 4½	4,400	44	08	52¾
Canadian Thorpe	" 4	106	33 to 36	"	2½ to 3½	4,420	42	24	49¼
Danish Chevalier	" 10	112	38 to 40	"	3½ to 4	4,200	40		53
Kinver Chevalier	" 10	112	34 to 38	"	4 to 4½	3,600	39	28	51¼
Beaver	" 5	107	34 to 36	"	3 to 3½	3,200	37	04	52¼
Goldthorpe	" 11	113	42 to 46	"	2½ to 3½	3,400	30		51½
Prize Prolific	" 11	113	40 to 42	"	3½ to 4½	3,100	29	08	52½
Duck-bill	" 4	106	34 to 36	"	2½ to 3½	3,200	28	12	50
Golden Grains	" 4	106	34 to 36	"	3 to 4	3,250	28	08	48¼
Bolton	" 10	112	30 to 34	"	3 to 3¼	3,000	27	04	53½
Thanet	" 10	112	42 to 44	"	4 to 4½	2,800	25	40	51½
California Prolific	" 11	113	32 to 36	"	2½ to 3	2,600	25	20	52½
Victor	" 10	112	42 to 45	"	2½ to 3	2,900	24	08	54¼
Duck-bill with common 6-rowed	" 4	106	34 to 38	"	2 to 2½	2,600	23	10	53½
Sidney	" 5	107	28 to 32	"	3 to 4	2,200	22	04	49½
Rigid	" 15	117	40 to 42	"	2 to 2½	2,840	20		49¾
Newton	" 10	112	28 to 32	"	3 to 3½	1,700	18	16	49¼
Pacer	" 10	112	44 to 48	Weak	3¾ to 4¼	1,840	16	32	
Monck	" 11	113	46 to 50	Stiff	3 to 4	2,000	16	12	
Nepean	" 4	106	22 to 26	"	2 to 2½	2,000	15	40	

BARLEY, SIX-ROWED—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw per Acre.	Yield per Acre.	
			Inches.		Inches.	Lbs.	Bush.	Lbs.
Common	Aug. 5	107	24 to 30	Fair	2 to 3	1,900	29	8
Mensury	July 28	99	32 to 36	"	$2\frac{1}{2}$ to 3	2,420	28	16
Baxter's six-rowed	" 30	101	30 to 33	Stiff	2 to $2\frac{1}{2}$	3,200	28	16
Oderbruch	Aug. 5	107	22 to 24	Fair	2 to $2\frac{1}{2}$	2,600	28	16
Pioneer	July 27	98	33 to 36	"	$2\frac{1}{2}$ to 3	2,200	26	12
Royal	" 29	100	28 to 32	Stiff	$2\frac{1}{4}$ to 3	3,020	25	22
Odessa	" 29	100	28 to 30	Weak	2 to $2\frac{1}{4}$	2,300	25	
Summit	Aug. 11	113	32 to 34	Stiff	$2\frac{1}{2}$ to 3	2,600	24	28
Excelsior	" 5	107	30 to 34	Fair	$2\frac{1}{2}$ to 3	2,200	23	36
Trooper	" 5	107	28 to 30	"	2 to $2\frac{1}{2}$	2,000	22	24
Champion	July 22	93	22 to 24	"	2 to 3	2,200	20	
Stella	Aug. 10	112	25 to 28	Weak	2 to $2\frac{1}{2}$	1,980	19	28
Rennie's Improved	July 29	100	24 to 26	Fair	$2\frac{1}{4}$ to $2\frac{3}{4}$	1,840	19	28
Nugent	Aug. 10	112	33 to 36	"	2 to $2\frac{1}{4}$	2,220	19	8
Surprise	" 10	112	26 to 30	Weak	2 to $2\frac{1}{4}$	1,940	18	36
Petschora	July 27	98	28 to 30	"	2 to $2\frac{1}{2}$	1,880	17	44
Vanguard	" 22	93	22 to 24	Fair	2 to $2\frac{1}{2}$	1,660	16	32
Success	" 22	93	18 to 22	Weak	2 to $2\frac{1}{2}$	2,200	15	20
Phœnix	" 24	95	22 to 24	Stiff	$1\frac{3}{4}$ to 2	1,340	15	

PEASE—TEST OF VARIETIES.

Twenty-six varieties of field pease were sown in this test, all on the 1st of April, on plots of $\frac{1}{20}$ of an acre each. The soil was loamy, but it was the first crop on land just ploughed and was not in good condition for any crop. The yield in some cases was fair, but where the soil was uneven in quality especially, where large trees had been grubbed out, the yield in a plot so situated was small.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Weight of Straw per Acre.	Length of Pod.	Size of Pea.	Yield per Acre.	
			Inches.	Lbs.	Inches.		Bush.	Lbs.
Arthur	Aug. 4	126	22 to 28	3,200	$2\frac{1}{2}$ to 3	Medium	27	20
Agnes	July 29	120	26 to 32	2,600	2 to $2\frac{1}{2}$	Large	21	40
Centennial	Aug. 11	133	46 to 50	2,500	$1\frac{1}{2}$ to 2	Medium	20	40
Carleton	" 11	133	48 to 52	2,540	$1\frac{1}{2}$ to 2	"	20	40
New Potter	" 11	133	46 to 50	2,560	$2\frac{1}{2}$ to 3	Large	20	..
Creeper	" 5	127	18 to 22	1,840	$1\frac{1}{2}$ to 2	Small	18	40
Bedford	" 6	128	36 to 40	2,440	2 to $2\frac{1}{4}$	"	18	40
Bruce	" 10	132	48 to 50	2,260	$1\frac{3}{4}$ to 2	Large bl'k eyed	18	20
Daniel O'Rourke	July 23	114	22 to 26	1,820	2 to $2\frac{1}{4}$	Small	17	40
Prince Albert	Aug. 14	136	33 to 38	2,240	2 to $2\frac{1}{2}$	"	16	40
Golden Vine	" 4	126	36 to 40	1,860	$1\frac{1}{2}$ to 2	"	15	40
Prince	" 14	136	55 to 60	1,920	$1\frac{3}{4}$ to $2\frac{1}{4}$	Large	15	..
Mackay	" 14	136	33 to 36	2,060	2 to $2\frac{1}{4}$	Large bl'k eyed	14	40
Paragon	" 14	136	33 to 36	1,880	$1\frac{3}{4}$ to 2	Large	14	20
Trilby	" 14	136	34 to 38	1,700	2 to $2\frac{1}{2}$	"	14	20
Duke	" 10	132	30 to 36	1,680	$1\frac{1}{2}$ to 2	Large bl'k eyed	14	20
Macoun	" 18	140	24 to 30	1,520	$1\frac{1}{4}$ to $1\frac{3}{4}$	Medium	14	..
Black-eyed Marrowfat	" 10	132	28 to 32	1,620	2 to $2\frac{1}{2}$	Large	13	..
Crown	" 10	132	20 to 24	1,440	2 to $2\frac{1}{2}$	Small	12	40

PEASE—Test of Varieties—*Concluded.*

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Weight of Straw per Acre.	Length of Pod.	Size of Pea.	Yield per Acre.	
			Inches.	Lbs.	Inches.		Bush.	Lbs.
Pride	Aug. 4	126	24 to 28	1,300	$1\frac{1}{2}$ to 2	Large	12	..
Kent	" 14	136	26 to 30	1,320	$1\frac{1}{4}$ to $1\frac{3}{4}$	Large bl'k eyed	12	..
Mummy	" 14	136	20 to 24	1,280	$1\frac{1}{4}$ to 2	Above medium,	11	40
Multiplier	" 14	136	34 to 38	1,460	$1\frac{1}{2}$ to 2	Small	11	40
Prussian Blue	" 14	136	28 to 30	1,240	2 to $2\frac{1}{4}$	Medium	11	30
White Marrowfat	" 14	136	26 to 30	1,300	$1\frac{1}{2}$ to 2	Large	10	40
Canadian Beauty	" 5	127	28 to 32	1,340	$1\frac{1}{2}$ to 2	"	10	..

RESULTS OF EARLY, MEDIUM, AND LATE SOWINGS.

Two varieties each of wheat, oats, barley and pease were sown in these tests. The land selected was of a loamy character with area enough for 48 plots of $\frac{1}{20}$ acre each. Eight of these were sown as early as practicable, and eight on the same day of each week following until six sowings had been made, thus covering a period of five weeks from the date of the first sowing. As nearly as possible the land for these test plots was all in the same condition. It was all prepared at the time of the first sowing and at each subsequent sowing all the unsown ground was thoroughly harrowed, which must have been of substantial benefit to the later sown plots.

OATS—Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Character of Straw.	Length of Straw.	Weight of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	
					Inches.	Lbs.	Inches.		Bush.	Lbs.
Banner	Apl. 3.	Aug. 11.	130	Stiff	36	169	8	Branching	40	20
"	" 10.	" 13.	125	"	36	165	8	"	41	06
"	" 17.	" 20.	125	"	36	185	8	"	40	
"	" 24.	" 22.	120	"	36	195	8	"	46	16
"	May 1.	" 24.	115	"	30	160	8	"	37	22
"	" 8.	" 24.	108	"	30	165	8	"	39	14
Abundance	Apl. 3.	" 11.	130	"	30	160	8	"	42	32
"	" 10.	" 13.	125	"	30	180	8	"	45	30
"	" 17.	" 20.	125	"	30	155	7	"	39	14
"	" 24.	" 22.	120	"	30	202	8	"	43	18
"	May 1.	" 24.	115	"	30	170	7	"	34	04
"	" 8.	" 24.	108	"	30	189	7	"	34	24

The land on which these plots were sown had only produced one crop, and was very ferny which, together with the drought, materially reduced the yield.

BARLEY—Early, Medium, and Late Sowings.

Name of Variety.	Date of sowing.	Date of ripening.	Number of Days Maturing.	Character of Straw.	Length of Straw.	Weight of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	
					In.	Lbs	In.		Bush.	Lbs.
Canadian Thorpe..........	April 3..	Aug. 7..	124	Stiff...:...	24	60	2	2 rowed...	12	24
"	" 10..	" 11..	120	"	24	69	2	" ...	13	36
"	" 17..	" 13..	115	"	24	63	2	" ...	13	16
"	" 24..	" 15..	110	"	24	80	2	" ...	15	20
"	May 1..	" 17..	105	"	24	90	2	" ...	17	24
"	" 8..	" 20..	101	"	24	80	2	" ..	13	36
Odessa....	April 3..	July 24..	115	Medium..	20 24	90	$2\frac{1}{2}$	6 rowed...	16	12
"	" 10..	" 29..	113	" ..	20 24	95	$2\frac{1}{2}$	" ...	18	16
"	" 17..	Aug. 3..	111	" ..	20 24	60	2	" ...	13	16
"	" 24..	" 5..	106	" ..	20 24	65	2	" ...	15	40
"	May 1..	" 11..	105	" ..	20 24	85	2	" ...	20	40
"	" 8 .	" 15..	101	" ..	20 24	80	2	" ...	17	04

WHEAT—Early, Medium, and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Character of Straw.	Length of Straw.	Weight of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	
					In.	Lbs.	In.		Bush.	Lbs.
Red Fife.........	April 3	Aug. 11	130	Stiff and bright.	33 to 36	155	$2\frac{1}{2}$ to 3	Beardless.	23	20
"	" 10	" 15	127	" ..	33 to 36	155	2 to 3	"	21	..
"	" 17	" 19	123	" ..	33 to 36	180	$2\frac{1}{2}$ to 3	"	27	40
"	" 24	" 22	120	" ..	33 to 36	190	$2\frac{1}{2}$ to 3	"	25	..
"	May 1	" 25	117	" ..	36 to 40	200	$2\frac{1}{2}$ to 3	"	23	25
"	" 8	" 27	115	Soft..........	36 to 40	180	2 to 3	"	18	40
Stanley	April 3	" 7	126	Clean and bright	30 to 36	132	2 to 3	"	20	40
"	" 10	" 11	123	" ..	30 to 36	130	2 to 3	"	21	20
"	" 17	" 15	119	" ..	24 to 30	110	2 to 3	"	15	20
"	" 24	" 19	115	" ..	24 to 30	105	2 to 3	"	14	40
"	May 1	" 22	112	" ..	20 to 24	80	2 to 3	"	12	40
"	" 8	" 25	108	" ..	20 to 24	100	2 to 3	"	12	40

The late sowings did not fill out to tip of heads; the straw was not so stiff and hard nor the berry as fine as in the earlier plots of this test.

PEASE—Early, Medium, and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.	
					In.	Lbs.	In.		Bush.	Lbs.
Mummy	Mar. 31..	Aug. 3..	125	Strong....	30 to 36	120	3 to 3½	Medium	22	40
"	April 7..	" 5..	120	"	30 to 36	140	3 to 3½	" .	23	20
"	" 14..	" 10..	115	Medium..	20 to 24	85	2 to 2½	" .	13	20
"	" 21..	" 14..	111	" ..	20 to 24	85	2 to 2½	" .	14	20
"	" 28..	" 18..	108	" ..	20 to 24	90	2 to 2½	" .	13	26
"	May 5..	" 19..	102	Slender ..	20 to 24	70	1 to 2	" .	12	..
Golden Vine	Mar. 31..	" 3..	125	Strong....	36 to 48	150	2½ to 3	Small...	25	20
"	April 7..	" 5..	120	"	36 to 48	150	2½ to 3	" ...	25	40
"	" 14..	" 10..	118	Medium..	30 to 40	110	2½ to 3	" ...	16	20
"	" 21..	" 14..	115	" ..	30 to 40	115	2½ to 3	" ...	17	40
"	" 28..	" 18..	112	Slender ..	24 to 30	80	1½ to 2	" ...	13	..
"	May 5..	" 19..	106	" ..	24 to 30	65	1½ to 2	....	6	40

Late sown pease suffered very severely from the long drought. The late plots in this test had very little rain from date of sowing to ripening. The dry autumn was very favourable for harvesting, and the grain is of a very fine quality.

EXPERIMENTS WITH INDIAN CORN.

Twenty-one varieties of field corn were grown for ensilage. The land was loamy and all the varieties were sown on the same day, 18th May. The season has been a fairly good one for this crop, the dry, hot summer suiting it better than our usual moist summer weather.

The yields are light, but in many cases the corn is better grown than in former years, and the quality of the ensilage will no doubt be better on that account. The yields per acre have been calculated in each case from the weight obtained from two rows, each 66 feet long.

INDIAN CORN—Test of Varieties.

Name of Variety.	Character of Growth.	Description of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Early Milk.	Late Milk.	Condition when cut.	Weight per Acre grown in Rows.	
			Inches.							Tons.	Lbs.
Cuban Giant	Very strong	White dent	100 to 120	Very leafy	Aug. 31	Sept. 20	...	...	No corn formed	20	1433
Mastodon	Strong	Dent	90 to 108	Above average	" 27	" 10	...	...	"	15	70
Longfellow	"	Yellow flint	72 to 96	Average	" 9	Aug. 18	Sept. 7	Sept. 24	Late milk	14	1700
Angel of Midnight	"	"	80 to 90	Above average	" 22	Sept. 1	" 14	...	Glazed	13	1500
White Cap Dent	"	Dent	108 to 120	Average	" 10	Aug. 20	" 15	...	"	12	300
Compton's Early	"	Yellow flint	70 to 85	"	" 15	" 31	" 14	...	"	11	1700
Leaming	"	Yellow dent	84 to 108	Very leafy	" 14	" 24	" 18	...	"	11	200
Pride of the North	"	Early dent	84 to 96	"	Sept. 1	Sept. 16	...	...	No corn formed	11	...
Thoroughbred White Flint	Medium	Flint	72 to 90	Leafy	Aug. 16	" 3	Sept. 20	Sept. 28	Late milk	9	700
Giant Prolific	Slender	White dent	96 to 108	Very leafy	Sept. 1	" 12	...	...	No corn formed	8	1600
Canadian White Flint	Medium	Flint	66 to 72	Average	Aug. 16	Aug. 27	Sept. 15	Sept. 26	Commencing to glaze	8	1233
Red Cob Ensilage	"	White dent	70 to 80	Very leafy	" 26	Sept. 5	" 27	...	Early milk	8	966
Sanford	"	White flint	66 to 72	Above average	" 18	" 3	" 20	...	Glazed	8	866
Early Yellow Flint	"	Yellow flint	72 to 84	Leafy	" 20	Aug. 29	" 16	Sept. 24	Late milk	8	500
King of the Earliest	Slender	Yellow dent	84 to 100	"	" 14	" 23	" 10	" 24	"	7	800
Early Huron Dent	Medium	Dent	70 to 80	Average	" 12	" 24	" 18	...	Glazed	7	720
Pearce's Prolific	"	Yellow flint	60 to 72	"	" 20	" 30	" 18	Sept. 24	"	6	1570
Champion White Pearl	"	White dent	70 to 80	"	Sept. 2	Sept. 24	...	...	No corn formed	6	1000
North Dakota	Strong	Flint	50 to 60	Very leafy	Aug. 12	Aug. 23	Sept. 10	Sept. 16	Glazed	6	836
Country Gentleman	Slender	White dent	51 to 60	Below average	" 20	Sept. 4	" 28	...	Early milk	4	1900
Mitchell's Extra Early	"	White flint	48 to 56	"	July 20	Aug. 24	Aug. 20	Aug. 26	Ripe	3	1340

EXPERIMENTS WITH TURNIPS.

Fourteen varieties of turnips were tested on plots alongside each other and under exactly similar conditions, sown in rows 2½ feet apart. The soil was very uniform in quality, of a loamy character, and the treatment has been the same in each case. Elephant and Jumbo have given the heaviest yields, and are very similar in growth and appearance. The season has been a very unfavourable one for this crop, being too dry and hot. The yield per acre has been calculated from the weight of the crop gathered from two rows each 66 feet long. Two sowings of each variety were made about two weeks apart.

TURNIPS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Jumbo	May 9.	May 23.	Oct. 26	Oct. 26.	24	1,280	821	20	22	1,760	762	40
Giant King	" 9.	" 23	" 25.	" 26	22		733	20	20	216	670	16
Rennie's Purple Top	" 9	" 23.	" 26	" 26.	17	1,728	595	28	15	536	508	56
East Lothian	" 9.	" 23.	" 25	" 26.	17	1,200	586	40	18	80	601	20
Sutton's Champion	" 9.	" 23.	" 26.	" 26.	17	1,468	591	08	15	448	507	28
Hartley's Bronze Top	" 9.	" 23.	" 26.	" 26	17	1,200	586	40	17	1,000	583	20
Marquis of Lorne	" 9	" 23.	" 25.	" 26.	15	888	514	48	15	1,328	522	08
Purple Top	" 9	" 23.	" 25.	" 26.	15	712	511	52	13	244	437	24
Carter's Elephant	" 9.	" 23.	" 26.	" 26.	13	400	440	00	14	600	476	40
Perfection	" 9.	" 23.	" 26.	" 26.	13	576	442	56	13	1,016	450	16
Pearce's Prize Winner	" 9.	" 23.	" 26	" 26.	13	136	435	36	13	1,368	456	8
Skirving's Purple Top	" 9.	" 23.	" 26	" 26.	12	1,784	429	44	12	1,432	423	52
Mammoth Clyde	" 9.	" 23.	" 26	" 26.	12	1,558	425	58	12	992	416	32
Selected Purple Top	" 9.	" 23.	" 26.	" 26.	12	1,256	420	56	12	904	415	4

EXPERIMENTS WITH MANGELS.

Twelve varieties of mangels were sown during 1896, on a loamy soil. They were sown in rows 2½ feet apart and two sowings were made in each case, the second two weeks later than the first. In each case the earliest sown has given the heaviest crop, the land was very uniform in quality and the treatment being the same the difference in yield is, no doubt, owing to the rows earlier sown getting better established before the dry weather set in, the yield per acre has been estimated from the weight of roots obtained from two rows each 66 feet long.

MANGELS—Test of Varieties.

Name of Variety.	Character of growth.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
						Ton.	lbs.	Bush.	lb.	Ton.	lbs.	Bush.	lbs.
Yellow Intermediate.	Strong..	Apl. 28.	May 12	Oct. 24.	Oct. 24.	39	1200	1320	..	32	1824	1097	4
Mammoth Long Red (Webb)..	" ..	" 28.	" 12.	" 24.	" 24	35	224	1170	4	33	...	1100	..
Giant Yellow Globe...	" ..	" 28.	" 12.	" 24.	" 21.	27	824	913	44	25	1856	860	56
Mammoth Long Red (Steele)............	Fair....	" 28.	" 12.	" 24.	" 24.	27	296	904	56	24	224	803	44
Golden Fleshed Tankard.................	"	" 28.	" 12.	" 24.	" 24.	26	1592	893	12	25	600	843	20
Gate Post.............	"	" 28.	" 12.	" 24.	" 24.	26	1944	899	4	19	1424	657	4
Oval Shaped Giant Globe	"	" 23.	" 12.	" 24.	" 21.	24	664	811	4	22	616	743	36
Warden Orange Globe.	"	" 23.	" 12.	" 24.	" 21.	23	728	778	48	26	536	875	36
Giant Yellow Intermediate..............	"	" 28.	" 12.	" 24.	" 24.	23	532	775	32	18	1664	627	24
Red Fleshed Tankard (Bruce)	"	" 28.	" 12.	" 24.	" 24.	22	1848	764	8	19	1864	664	24
Canadian Giant (Pearce)	"	" 23.	" 12.	" 24.	" 24.	22	....	733	20	21	1824	730	24
Champion Yellow Globe (Steele).............	"	" 28.	" 12.	" 24.	" 24.	22	1672	761	12	17	1024	583	44

EXPERIMENTS WITH CARROTS.

Fourteen varieties of carrots were under test. The land on which these were sown was loamy and of fair quality, had produced a crop of grain in 1895, and received a dressing of stable manure in the spring.

The seed was sown in drills 18 inches apart, and the plants thinned to 4 inches in the drill; two sowings were made in each case the second about two weeks later than the first. The yield per acre has been calculated in each case from the weight of roots gathered from two rows each 66 feet long.

CARROTS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre.							
					1st Plot.		1st Plot.		2nd Plot		2nd Plot	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Improved Short White..........	Apl. 24.	May 8.	Oct. 23.	Oct. 23.	26	700	878	20	25	500	841	40
Half Long White................	" 24.	" 8.	" 23.	" 23.	24	400	806	40	19	1,306	655	06
Giant Yellow Intermediate......	" 24.	" 8.	" 23.	" 23.	22	...	733	20	23	1,666	794	26
Mammoth White Intermediate...	" 24.	" 8.	" 23.	" 23.	22	...	733	20	21	1,800	730	
Giant White Vosges............	" 24.	" 8.	" 23.	" 23.	20	1,060	684	20	19	1,600	660	
White Belgian..................	" 24.	" 8.	" 23.	" 23.	19	866	647	46	18	1,390	623	10
Early Gem......................	" 24.	" 8.	" 23.	" 23.	19	573	642	53	18	666	611	06
Half Long Chantenay..........	" 24.	" 8.	" 23.	" 23.	19	133	635	33	17	1,200	583	20
Guerande or Ox Heart..........	" 24.	" 8.	" 23.	" 23.	18	666	611	06	14	1,333	488	53
Carter's Orange Giant..........	" 24.	" 8.	" 23.	" 23.	16	1,753	562	33	15	800	513	20
Long Scarlet Altringham..	" 24.	" 8.	" 23.	" 23.	16	1,733	562	13	14	1,323	488	43
Long Orange or Surrey..........	" 24.	" 8.	" 23.	" 23.	14	1,383	489	43	13	1,866	464	26
Iverson's Champion............	" 24.	" 8.	" 23.	" 23.	13	400	440	....	23	933	782	13
Scarlet Intermediate............	" 24.	" 8.	" 23.	" 23.	9	1,926	332	6	9	1,077	317	57

SUGAR BEETS.

Three varieties were tested this year on sandy loam. Two sowings were made with each variety at an interval of two weeks. The drought had already set in before the young plants were well established, and the yield is a very light one. For general feeding this is not a profitable crop owing to smaller yield, and greater difficulty in harvesting on account of the more branching nature of the roots. The yield per acre has been calculated from the product of two rows each 66 feet long.

SUGAR BEETS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre.							
					1st Plot		1st Plot		2nd Plot		2nd Plot	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Vilmorin's Improved	May 18.	June 1.	Oct. 27.	Oct. 27.	7	80	234	40	5	560	176	
Austrian Electoral	" 18.	" 1.	" 27.	" 27.	6	1,200	220	..	5	1,440	190	40
Lane's Improved	" 18.	" 1.	" 27.	" 27.	5	1,440	190	4	5	560	174	20

EXPERIMENTS WITH POTATOES.

Eighty-six varieties of potatoes were planted on May 14th on a loamy soil.

The seed was cut into sets, with not less than two strong eyes each, planted in drills 30 inches apart, and the sets about 1 foot apart in the drill. Owing to the drought the yield is very light, but the quality of the tubers is very good, and there was no rot. The yield per acre has been calculated from the weight of tubers gathered from two rows each 66 feet long.

POTATOES—Test of Varieties.

Name of Variety.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.		Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Seedling No. 230	220	..	198	..	22	..	White.
Money Maker	205	20	164	06	41	14	"
Clay Rose	205	20	184	48	20	32	Pink.
Rochester Rose	198	..	168	18	29	42	"
Dakota Red	184	40	175	26	9	14	Red.
Pride of The Market	183	20	164	50	18	30	White.
Polaris	176	15	167	27	8	48	"
General Gordon	176	10	140	48	35	22	Pink.
Delaware	176	..	158	24	17	36	White.
American Giant	168	40	160	14	8	26	"
Monroe County	164	16	147	56	16	20	Red.
Carman No. 1	162	38	138	16	24	22	White.
McKenzie	161	40	137	28	24	12	"
Vanier	161	20	129	08	32	12	Red.
Russell's Seedling	161	08	129	04	32	04	White.
Rural Blush	155	16	123	45	31	31	Pink.
Green Mountain	154	46	146	48	7	58	White.
Beauty of Hebron	154	34	131	24	23	10	Pink and white.
Record	148	52	111	39	37	13	White.
Chicago Market	148	40	139	58	8	42	Red.
Orphans	147	20	139	20	8	..	White.
Satisfaction	147	10	120	30	26	40	"
Freeman	146	40	110	20	36	20	"
Brownell's Winner	146	20	117	04	29	16	Red.
Early Gem	145	50	117	20	38	30	Rose.
Early Rose	140	40	119	34	21	06	"

POTATOES—Test of Varieties—*Continued.*

Name of Variety.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.		Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Henderson's Late Puritan	139	36	132	38	6	58	White.
Early White Prize	139	20	125	24	13	56	"
Queen of the Valley	135	40	128	48	6	52	Pink.
Pearce's Extra Early	134	36	121	28	13	08	Pink and white.
Seedling No. 7	133	10	120	40	12	30	Red.
New Variety No. 1	133	..	125	10	7	50	White.
Maggie Murphy	132	48	118	48	14	..	Pink.
Hale's Champion	132	30	118	00	14	30	White.
Early Norther	132	16	118	30	13	46	"
Crown Jewel	132	..	125	24	6	36	Pink and white.
Irish Daisy	130	32	117	25	13	07	White.
Northern Spy	126	08	113	32	12	36	Pink.
Everett	124	40	112	12	12	28	"
Reading Giant	118	46	96	08	22	38	Red.
Victor Rose	118	15	100	15	18	..	Pink.
Thorburn	118	10	99	52	18	18	"
Early Ohio	117	56	99	44	18	12	"
Burnaby Seedling	117	20	105	36	11	44	"
Burpee's Extra Early	117	5	105	21	11	44	"
I X L	115	40	95	14	20	26	"
Stourbridge Glory	112	44	68	27	44	17	White.
Late Puritan	111	20	89	10	22	10	"
Daisy	111	5	99	14	11	51	Pink.
Seedling No. 3.	110	50	89	50	21	..	Red.
Great Divide	110	..	78	..	32	.	White.
Early Sunrise	110	..	93	30	16	30	Pink.
Ideal	109	16	98	21	10	55	"
Lightning Express	108	32	103	07	5	25	Red.
Sharpe's Seedling	108	28	96	20	12	8	Pink.
Early Puritan	105	36	95	03	10	33	White.
Troy Seedling	103	58	78	09	25	49	"
Peerless Junior	103	24	93	..	10	24	"
Prize Taker	103	5	87	16	15	49	Pink.
American Wonder	102	40	87	26	15	14	White.
Seattle	102	35	85	07	17	28	"
Early Harvest	101	50	81	56	19	54	"
Empire State	96	48	87	08	9	40	"
Harbinger	96	31	69	45	26	47	Pink.
Seedling No. 214	96	10	71	38	24	32	White.
Ash Leaf Kidney	95	58	85	48	10	10	"
Flemish Beauty Seedling	95	30	74	30	21	..	Pink.
White Beauty	95	20	85	28	9	52	White.
State of Maine	95	.	89	53	5	7	"
Earliest of All	94	28	71	30	22	58	Pink.
Lawton's White	94	10	79	36	14	34	White.
Seedling No. 25	88	46	67	20	21	26	"
Pearce's Prize Winner	88	20	79	12	9	08	Pink.
London	82	40	72	..	10	40	"
Seedling No. 3	80	40	40	.	40	40	White; purple eyes.
Wonder of the World	73	20	58	40	14	40	Pink.
Early Six Weeks	73	10	66	50	6	20	"
Lizzie's Pride	70	20	62	20	8	..	"
Clarke's No. 1	66	58	52	48	14	10	"
New Queen	66	26	49	30	16	56	"
Hopeful	58	28	47	10	11	18	White.
Table King	58	20	46	56	11	24	"
Seedling No. 14	52	30	32	20	20	10	"
Vanguard	51	20	41	04	10	16	Pink.
Holborn Abundance	44	48	39	30	5	18	White.
Dreer's Standard	39	36	22	56	16	40	Pink.

MIXED GRAIN CUT FOR HAY.

These mixtures of cereals were sown on loamy soil on plots of $\frac{1}{10}$th of an acre each. Mixture No. 1 yields this year, as it did in 1895, the heaviest crop, and is, I think, otherwise a better feed. In No. 2 the barley ripens ahead of the other grains, and is likely to reach too near maturity to be as palatable as the wheat in mixture No. 1. Both mixtures make good feed, especially for milch cows.

MIXED GRAIN SOWN FOR HAY.

Name of Variety.	Date of Sowing.	Character of Growth.	Weight per acre. Green.	Weight per acre. Cured.	Remarks.
			Tons. Lbs.	Tons. Lbs.	
Mixture No. 1.					
Golden Vine pease, 1 bush. per acre; Red Fife wheat "; Banner oats "	April 25..	Strong ...	8 1,700	4 1,337	Cut July 18 when wheat was in late milk.
Mixture No. 2.					
Golden Vine pease, 1 bush. per acre; Prize Prolific barley "; Banner oats "	" 25..	" ..	7 1,930	3 1,201	Cut July 18 when oats were in milk.

EXPERIMENTS WITH CLOVER, SOWN WITH GRAIN.

Twenty $\frac{1}{4}$ acre plots were used in this test, ten of which were sown with different varieties of grain with which was sown Mammoth Red clover at the rate of 12 pounds per acre, while ten similar plots were sown alternately with the same varieties of grain without clover. The objects of this series of tests was to gain information as to whether the sowing of clover with grain influenced the yield of the grain, and how far the vigour and bulk of the clover crop, and hence its usefulness for ploughing under as a fertilizer, was influenced by the kind of grain with which it was grown.

The land chosen for all of these tests, excepting those which were sown with Banner Oats, had been under clover the year previous, which had made considerable growth when it was ploughed under for this crop, and the dry weather beginning soon after the plots were sown, the clover sod did not rot well, and consequently was of little or no advantage as a fertilizer. The clover sown this year made a good catch on all the plots and, at the time of harvesting the grain, had made a thick mat of about six inches high.

TESTS of grain on one-quarter acre plots, sown with and without clover.

Name of Grain.	Date of sowing.	Date of ripening.	Yield of grain per acre.		Remarks.
			bush.	lbs.	
Wheat—					
Red Fife	April 29	Aug. 22	20	00	Without clover.
"	" 29	" 22	14	24	With clover.
Stanley	" 29	" 22	23	52	Without clover.
"	" 29	" 22	16	00	With clover.
Barley, 2-rowed—					
French Chevalier	" 29	" 27	14	28	Without clover.
"	" 29	" 27	12	36	With clover.
Beaver, 2-rowed	" 29	" 24	15	28	Without clover.
"	" 29	" 24	11	56	With clover.
Trooper, 6-rowed	" 29	" 19	14	00	Without clover.
"	" 29	" 19	13	28	With clover.
Rennie's Improved, 6-rowed	" 29	" 19	10	20	Without clover.
" "	" 29	" 19	9	15	With clover.
Pease—					
Golden Vine	" 29	" 18	16	40	Without clover.
"	" 29	" 18	11	52	With clover.
Mummy	" 29	" 18	37	20	Without clover.
"	" 29	" 18	30	08	With clover.
Oats—					
Banner	" 29	" 22	67	14	Without clover.
"	" 29	" 22	41	10	With clover.
Abundance	" 29	" 22	36	00	Without clover.
"	" 29	" 22	25	02	With clover.

In every instance in the series of tests the sowing of the clover with the cereals planted appears to have lessened the weight of the grain harvested.

EXPERIMENTS WITH FLAX.

These experiments with flax were planned for the purpose of gaining information as to the quantity and quality of fibre and of seed which could be produced per acre in the coast climate of British Columbia, when the seed was sown at the rate of 40 pounds per acre and 80 pounds per acre, also as to the best time for sowing in that climate.

The plots were $\frac{1}{10}$ of an acre each, the soil was sandy loam, part of which had been under root crops in 1895 and the remainder pease, and all of it was in fair condition as to fertility. All the plots suffered from the drought but the later tests very much more than the earlier ones, as is shown by the results; one-half of each plot was pulled for fibre when the lower leaves and stalk became yellow, and part of the balls were ripe, on the other half the seed was allowed to ripen before harvesting.

Crops of flax grown in previous and more favourable seasons were heavier, the stalks being longer and the yield of seed greater. Then, as in this instance, the advantage of sowing flax as early in the spring as practicable, was conclusively shown.

Fifty pounds each of the first and second sowings were sent to Messrs. J. & J. Livingston, Baden, Ontario, who will test its value for manufacturing purposes.

RESULTS obtained from test plots of Flax.

No. of Plot.	Quantity of seed per Acre.	When sown.	When pulled.	Length of stalk when pulled.	Weight of straw when pulled.		Yield of seed per Acre.	
	Lbs.			Inches.	Tons.	Lbs.	Bush.	Lbs.
No. 1	40	May 15	Aug. 10	30	1	1,200	10	40
" 2	80	" 15	" 10	28	1	1,400	12	8
" 3	40	" 22	" 24	28	1	1,000	11	24
" 4	80	" 22	" 24	27	1	1,280	12	8
" 5	40	" 29	" 31	22	1	160	4	16
" 6	80	" 29	" 31	25	1	600	6	24
" 7	40	June 5	" 31	19		1,600	3	32
" 8	80	" 5	" 31	18		1,680	5	..

LATHYRUS SYLVESTRIS WAGNERI.

A large number of packages of seed of this plant have been distributed every year for several years to farmers in different parts of British Columbia and of the North-west Territories. The reports received up to the present do not justify the high character given to it by the introducers.

YIELD OF HAY, FODDER CROPS, AND ROOTS.

Hay, first crop	14 tons	340 lbs.	
" second crop	3 "	1,000 "	
Mixed grains cut for feed	12 "	500 "	
Turnips	35 "	50 "	
Carrots	14 "	200 "	
Mangels	35 "	50 "	
Corn in silo	34 "		

The first crop of clover was cut in June, and the second in August. The same area of land was cut over, and the very small second crop shows how extreme the drought was. With ordinary weather the second crop would have been over ten tons.

EXPERIMENTS WITH GARDEN PEASE.

Sixteen varieties of garden pease were tested, on loamy soil, and all sown on the 16th of May. Owing to the drought and heat they ripened very rapidly after becoming fit for the table. The earlier varieties only remaining green and succulent for a few days.

GARDEN PEASE—Test of Varieties.

Name of Variety.	Fit for table	Number of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Average No. of Pease in Pod.	Productiveness.
				Inches	Inches.			
Shropshire Hero	July 27.	72	Strong	30	3 to 4	Large	6	Very fine quality, productive.
Heroine	" 27.	72	"	24	3 to 4	"	8	Good quality, fair.
Prince of Wales	" 24.	69	"	36	3	Very large	5	Good quality, productive.
Stratagem	" 27.	72	Medium	18	$2\frac{1}{2}$ to $3\frac{1}{2}$	Large	5	Very good, productive.
Telegraph	" 24.	69	Strong	30	$3\frac{1}{2}$	"	7	Very good, productive.
Duke of Albany	" 30.	75	Very strong.	55	$2\frac{1}{2}$	Medium	5	Very fine quality, medium.
Little Giant	" 11.	56	Medium	14	2	"	6	Fair quality, medium.
Bliss' Abundance	Aug. 4.	80	"	13	2	"	6	Fair quality, medium.
Maud S	July 9.	54	"	22	2	Small	5	Medium quality, prolific.
Sunol	" 9.	54	"	22	$1\frac{1}{2}$ to 2	"	5	Medium quality, prolific.
Daniel's Matchless Marrow	" 27.	72	Strong	45	3 to $4\frac{1}{2}$	Very large.	9	Very fine quality, prolific.
Burpee's Profusion	" 27.	72	"	30	3	Large	5	Very fine quality, prolific.
Horsford's Market Garden.	" 26.	71	Medium	18	$2\frac{1}{2}$	Medium	6	Good quality, very prolific.
Juno	Aug. 6.	82	"	18-24	3	"	6	Good quality, medium.
Harris' Dwarf Mammoth	July 27.	72	"	24	$2\frac{1}{2}$	Large	5	Good quality, very prolific.
C. P. R.	Aug. 6.	82	"	24	$2\frac{1}{2}$	Medium	3	Pods not well filled, medium quality, moderately prolific.

APPLES.

This has been an off year for apples. Very few varieties gave a fair crop, and many varieties only a few specimens.

The insect known as the Apple Fruit Miner did considerable damage to the fruit in many places in the coast region. Several varieties suffered much from this cause on the Experimental Farm. The Maiden's Blush, St. Lawrence, Stark, Wellington and American Pippin suffered the most. The injured fruit was gathered and fed to stock before the maggots had left the apple, and it is hoped that this treatment will check the ravages of this pest. The trees were sprayed three times with Bordeaux mixture and Paris green for scab and caterpillars, but this does not appear to have been useful in killing the Apple Fruit Miner to any considerable extent.

The trees have made a vigorous growth the past season, and give promise of plenty of fruit next year. Several of the younger trees produced fruit this season for the first time. The following is a list of some of the most promising sorts :—

BISMARCK.—Tree, a free, strong grower. Fruit, very large, oblate. Skin, green, nearly covered with splashes of red. Flesh, white, rather coarse, mild acid. Said to be a good keeper.

STURMER PIPPIN.—Tree vigorous. Fruit medium size, oblate, conical. Skin russet green, sprinkled with grayish dots. Flesh firm, rich sub-acid. Winter.

MANNINGTON PEARMAIN.—Tree a free grower. Fruit of medium size, roundish, conical. Skin yellowish green, sprinkled with grayish dots. Flesh yellowish, firm, crisp, pleasant sub-acid. Late fall.

NONPAREIL.—Tree a moderate grower. Fruit small, roundish, skin greenish yellow, nearly covered with russet. Flesh crisp, juicy, aromatic, mild acid. Winter.

WASHINGTON.—Tree a vigorous grower. Fruit large, roundish, conical. Skin yellow splashed with red. Flesh yellow, crisp, tender, juicy, and pleasantly acid. September.

YELLOW INGESTRE.—Tree a moderate grower. Fruit small, roundish oblate. Skin golden yellow. Flesh crisp, tender and juicy, mild acid. October.

REINETTE GRIS FRANCAISE.—Tree a moderate grower. Fruit of medium size, round flattened. Skin green, freely sprinkled with russet dots. Flesh firm, crisp and juicy. December.

INGRAM.—Tree vigorous. Fruit small, round flattened. Skin greenish yellow, with small splashes of red, and sprinkled with whitish dots. Flesh yellowish, crisp, juicy sub-acid. Winter.

TRENTON.—Tree a moderate grower. Fruit above medium size, somewhat conical. Skin greenish yellow, nearly covered with dull red. Flesh soft, mild sub-acid. August and September.

ISHAM'S SWEET.—Tree vigorous. Fruit large, conical. Skin green, nearly covered with russet. Flesh yellow, rather coarse, sweet. Fall.

RUSSIAN TYROL.—Tree a moderate grower. Fruit of medium size, conical. Skin greenish yellow, with dull red in the sun, and considerable russet. Flesh a little coarse, white, moderately juicy, mild sub-acid. Winter.

APPLES PREFERRED FOR COMMERCIAL ORCHARDS.

Of the apples that have yet fruited on the Experimental Farm, the following would be preferred for winter, if planting a commercial orchard :—

SALOME.—Tree vigorous and productive. Fruit of medium size, conical ; skin yellow, splashed and streaked with pale red ; flesh crisp, yellowish white, firm, juicy, pleasant sub-acid. Late winter.

YORK IMPERIAL.—Tree vigorous and productive. Fruit, of medium size, oblong, oblique ; skin yellow, nearly covered with bright red ; flesh yellowish, firm, crisp, juicy, mild sub-acid. Late winter.

BELLE DE BOSKOOP.—Tree vigorous and productive. Fruit above medium size, oblong oblate ; skin greenish yellow, with considerable russet, and a reddish cheek on sunny side ; flesh a little coarse, crisp, tender, juicy, with a rich flavour. February.

GRIMES' GOLDEN.—Tree a moderate grower, but productive. Fruit medium size, oblong, oblate ; skin yellow, sprinkled with small grayish dots ; flesh yellow, crisp, tender, juicy, mild, pleasant sub-acid. February.

SUTTON BEAUTY.—Tree vigorous and moderately productive. Fruit of medium size, roundish, conical ; skin yellow, nearly covered with splashes of red, and sprinkled with whitish dots ; flesh white, tender, crisp, juicy, sub-acid. November to February.

RIBSTON PIPPIN.—Tree a moderate grower. Fruit of medium size, oblate ; skin greenish yellow, with a dull, reddish blush, and nearly covered with russet ; flesh yellow, crisp, tender, juicy and high flavoured, mild sub-acid. December to January.

There are others that perhaps are nearly as desirable ; and when all the varieties now on the farm have fruited many more will, doubtless, be found of equal merit ; but these are productive, of good quality, and very free from blemish.

Many of the apple trees received this year have been planted in the orchard, nearly seven acres having been planted this year with apple trees. But a large number have been put in the nursery until sufficient land has been cleared and ploughed so that they can be planted.

Two hundred and fifty-six varieties have been added to the collection since my last report, bringing the number of named varieties of apples now on the Experimental Farm up to over eight hundred.

CRABS.

Queen's Choice.—Tree a vigorous, strong grower, and productive. Fruit of medium size, round, oblong; skin clear yellow, with bright red on the sunny side; flesh white, crisp and pleasant.

Soulard.—Tree vigorous. Fruit of medium size, oblate; skin greenish yellow, nearly covered with bright red, and freely sprinkled with grayish dots; flesh white, crisp and astringent.

Marengo.—Tree vigorous. Fruit small, oblate; skin green, nearly covered with dark purple; flesh white, juicy, acid.

Hyslop, Whitney, Montreal Beauty, Yellow Siberian, and General Grant, fruited sparingly this year, but had fruited freely for two years previous.

The Transcendent was badly affected, from the time of planting in the spring of 1890, to the spring of 1894, in the leaf with the scab fungus, and although blossoming freely did not fruit. The trees were sprayed with Bordeaux mixture, in the seasons of 1892, 1893 and 1894, but the fungus appeared to be on every leaf. In the spring of 1895 they were sprayed with the lime, sulphur and salt preparation, followed during the summer with three sprayings of Bordeaux mixture, and the growth that year was healthy, with very little of the fungus. They were treated the same way this last season, and the foliage showed very slight evidence of scab; the growth was vigorous, and there was a fair crop of clean, handsome fruit.

The scab appears to be very difficult to control in this climate, but the success in the case of the Transcendent leads to the hope that such varieties as the Fameuse and Graventein, which are very susceptible to injury from this cause, may be protected, if treated in the same way.

PEARS.

Very few of the older pear trees produced an average crop although many of them bloomed freely.

The Clairgeau, Angouleme, Armand Morelle, Doyenne, Boussock, Margaret, Louise Bonne de Jersey, and Osband's Summer had fair crops, and many of the others produced a few specimens.

Of the younger trees, Durondeau, B. Capiaumont, and Knight's Monarch produced fair crops.

Durondeau.—Tree vigorous. Fruit of medium size, acute, pyriform, irregular; skin yellow, covered with a handsome russet, with a warm blush on the sunny side and many small, brown dots; flesh juicy, melting, sweet, with a rich flavour. Ripe October.

Beurre Capiaumont.—Tree vigorous. Fruit of medium size, long, turbinate, tapering; skin smooth, yellow, with a light red cheek; flesh buttery, melting, sweet, good flavour. Ripe early in October.

Knight's Monarch.—Tree vigorous. Fruit under medium size; skin yellowish green, with russet and many gray dots. Flesh melting, sweet, pleasant. Ripe December.

The following varieties produced a few specimens :—

St. Swithin.—Tree moderately vigorous. Fruit small, acute, pyriform; skin yellowish green, sprinkled with brownish dots. Ripe August.

Marie Louise D'Uccle.—Tree vigorous. Fruit large, obovate, pyriform; skin rough, yellow, brown on the sunny side, freely sprinkled with russet dots; flesh white, melting, juicy, slightly astringent. Ripe last of September.

Hessle.—Tree vigorous, fruit small obovate, skin green with a brownish russet, freely sprinkled with brown dots. Flesh white, juicy, sprightly pleasant. Ripe early in September.

Aston Town.—Tree, a moderate grower. Fruit small, roundish, turbinate. Skin greenish yellow, with brown dots. Flesh white, rather soft, sweetish and buttery. Ripe last of September.

Magnate.—Tree, a moderate grower. Fruit large pyriform; skin greenish yellow, nearly covered with brownish russet, with a brown red check in the sun; flesh yellow juicy, fine grained. Ripe last of October.

Thompson.—Tree, a strong grower, fruit of medium size, obovate, pyriform; skin greenish yellow, with patches of russet; flesh white, buttery, sweet, and of very fine quality. Ripe last of October.

Princess (Rivers).—Tree vigorous. Fruit above medium size, oblong pyriform; skin green, with gray dots, and a reddish russet on the sunny side; flesh white, very juicy, melting, with a rich flavour. Ripe last of October.

Dr. Jules Guyot.—Tree vigorous. Fruit very large, oblong, obtuse pyriform; skin yellow, with small dots sprinkled over the surface and a faint blush on the sunny side. Flesh white, very juicy, melting with a very fine flavour, very good. Ripe early in August.

Fertility.—Tree moderately vigorous. Fruit of medium size, obovate, skin yellow with a warm blush. Flesh juicy, melting and pleasant. Ripe last of September.

Beaupresent Espargne.—Tree vigorous. Fruit of medium size, oblong pyriform, skin greenish yellow, sprinkled with gray dots. Flesh white, juicy, gritty and astringent. Ripe last of August.

The following Russian pears fruited freely. They are of little value in this climate.

Gliva Kurskya.—Tree very vigorous. Fruit of medium size. Flesh white, not juicy, sweetish and of poor quality. Ripe, September.

Sapieganka.—Tree very vigorous. Fruit of medium size, coarse grained, dry and of poor quality. Ripe early in October.

Tonkovietka.—Tree very vigorous. Fruit of medium size. Flesh coarse, dry, granular and astringent. Ripe September.

Dula Medviedovka.—Tree very vigorous. Fruit below medium size. Flesh coarse and dry. Ripe early in August.

Bessemianka.—Tree vigorous. Fruit of medium size. Flesh moderately juicy, sweetish, fine grained and of fair quality. Ripe September.

Clairgeau, Louise Bonne, Anjouleme, Dearborn's Seedling and Margaret, have been the most productive of the desirable varieties of those planted in 1890 and 1891. Bartlett although a very fine pear, has been rather a shy bearer, up to the present time, having only produced a few specimens, in the last three seasons, while the varieties above mentioned have given fair crops.

Of the new varieties, Dr. Jules Guyot for early, Durondeau and Beurre Capiaumont, for late autumn, are the most promising that have fruited this year.

The number of varieties added to the collection this year has been very large, and when all have fruited valuable sorts for the whole pear season should be found among them.

From Germany and different parts of America there have been received in all 162 additional varieties, most of these were trees, but some were obtained as scions for grafting or budding.

PLUMS.

The season was not favourable for plums, and many of the older trees, although full of bloom, set very little fruit.

Some varieties, however, gave a good crop.

Quite a number of the younger trees fruited this year, and some of them promise to be valuable for the coast region of British Columbia.

The following varieties bore well this year, and have given good crops in the three previous years:—

Gueii, American Violet, Duane's Purple, Lombard, Monroe, Hudson River Purple Egg and Shipper's Pride. Niagara and Bradshaw gave a fair crop this year also, but they had not given heavy crops in previous years.

Of the above varieties the Gueii has thus far been the most profitable. The fruit is above medium in size, of a deep purple colour, with a blue bloom, and is a good shipper. The tree is a strong vigorous grower.

Shipper's Pride and Hudson River Purple Egg are nearly but not quite so productive, and the trees of both sorts are vigorous and healthy.

The fruit of American Violet is somewhat larger than either of the last three named, and the tree is very productive, but it is a feeble grower. All four of these ripen about the same time, and are handsome and ship well.

Bradshaw and Niagara are very similar in growth of tree and appearance of fruit, and are both of the best, but require more age than some others before becoming profitable in production. They yield heavy crops of very large and handsome plums of good shipping quality.

The following varieties fruited this year for the first time. They are given in the order of ripening with a short description of the fruit.

CEYAR.—Tree vigorous and productive; fruit above medium size; oval; dark purple, with a whitish bloom of fine flavour; ripe 24th July.

RICHLAND.—Tree a medium grower; fruit of medium size; oval; greenish purple; ripe 4th August.

RED NEGATE.—Tree a feeble grower; not productive; fruit of medium size; pointed heart-shape; red with a thin whitish bloom; juicy, but not high flavoured; ripe 14th August.

RIVER'S EARLY.—Tree vigorous and productive; fruit small, round, oval; dark purple; juicy and of pleasant flavour; ripe 15th August.

SPAULDING.—Tree a vigorous grower; fruit of medium size; long, oval; greenish yellow; ripe 15th August.

HERON.—Tree a moderate grower; productive; fruit large, oblong; greenish yellow, with a bright purple blush nearly covering the skin; ripe 16th August.

CURLEW.—Tree vigorous and prodvctive; fruit of medium size; round, oval; purple, with a heavy bloom; ripe 16th August.

YELLOW VORONESH.—Tree moderately productive; fruit large; shape and colour similar to Yellow Egg, but not so large; flesh dry, granular and of rather poor flavour; ripe 16th August.

MALLARD.—Tree vigorous; fruit above medium size; round, oval; light reddish purple; flesh firm, juicy and sweet; ripe 16th August.

MITCHELSON.—Tree vigorous, moderately productive; fruit below medium in size; oval; dark purple; ripe 17th August.

CLUSTER DAMSON.—Tree vigorous and productive; fruit small; round, oval; nearly black, with a heavy blue bloom; ripe 18th August.

KING OF THE DAMSONS.—Tree vigorous and productive; fruit small, round, oval; dark purple, with a blue bloom; ripe 18th August.

DAMSON PRUNE.—Tree very productive. Fruit small, oval, dark purple, with a heavy bloom. Ripe, 18th August.

SULTAN.—Tree vigorous and moderately productive. Fruit large, round, bright purple. Ripe, 18th August.

GISBORNES.—Tree vigorous and productive. Fruit above medium size, round oval, greenish yellow, juicy, pleasant. Ripe, 18th August.

CLYMAN.—Tree vigorous. Fruit medium size, oval, light red, with a bluish bloom. Ripe, 18th August.

DIAMOND.—Tree vigorous. Fruit large, oval, purple, with a bluish bloom. Flesh firm and juicy. Ripe, 20th August.

DENISTON'S SUPERB.—Tree a moderate grower. Fruit above medium in size, round, greenish yellow. Flesh juicy, rich, fine flavour. Ripe, 20th August.

BELGIAN PURPLE.—Tree vigorous. Fruit above medium size, roundish oval, dark purple with a blue bloom. Flesh firm, sweet, and very good. Ripe, 28th August.

COX'S EMPEROR.—Tree vigorous. Fruit large, round, light reddish, purple. Flesh firm, sweet and rich, free stone. Ripe, 5th September.

ORLEANS NEW.—Tree a moderate grower. Fruit below medium size, round oval, red with a thin whitish bloom. Ripe, 16th September.

MONARCH.—Tree vigorous. Fruit large, dark purple, with a thick bluish bloom. Flesh firm and juicy, a good shipper. Promises to be valuable. Ripe, 16th September.

GRAND DUKE.—Tree a vigorous, upright grower. Fruit very large, similar in appearance to Bradshaw. Ripe, September 16th.

KIRKE'S.—Tree vigorous. Fruit above medium size; pear-shaped, pale reddish purple, with small yellow dots, and a whitish bloom. Flesh, sweet, juicy and of fine flavour. Ripe, 20th September.

MIRABELLE PETITE.—Tree of slender growth. Fruit very small, round, yellow, with reddish dots; stone very small. Ripe, 24th September.

BITTERN.—Tree vigorous. Fruit above medium size, oval, purple, with a heavy blue bloom. Flesh firm and juicy. Ripe, 26th September.

ST. CATHERINE.—Tree vigorous. Fruit of medium size, nearly pear-shaped, pale yellow, with a thin white bloom. Flesh firm, juicy and sprightly. Ripe, 28th September.

BELLE DE SEPTEMBRE.—Tree vigorous. Fruit above medium size, round, light red, with a thin blue bloom. Ripe last of September. An excellent shipper.

A number of these varieties produced fine crops of fruit this year and promise to be valuable for the coast region.

The most desirable, judging by the standard of productiveness, size, beauty and shipping qualities, are Grand Duke, Monarch, Cox's Emperor, Belle de Septembre, with Czar for a very early variety. But further evidence will be required to confirm this opinion.

CHERRIES.

The cherry trees bloomed very freely, and gave promise of a heavy crop, but most of the bloom fell off, there was however a light crop of some varieties, and some of the young trees gave a very fair crop.

The following are those which fruited this year for the first time:

ARCH DUKE.—Fruit large, heart shaped, deep red colour, flesh firm, juicy, and pleasant, ripe 5th July.

FROGMORE EARLY BIGARREAU.—Fruit large, heart shaped, colour yellow with a reddish cheek, flesh nearly white, firm, crisp, juicy, sweet, and pleasant, ripe 6th July.

DUNTON.—Fruit large, pointed heart shaped, colour reddish yellow, flesh firm, and skin tough, would ship well, ripe 9th July.

CERISE D'OSTHEIM.—Fruit small, round, flattened, colour dark red, flesh dark red, crisp, juicy, pleasantly acid, stone rather large, ripe 9th July.

OREL NO. 23.—Fruit small, colour pale yellow, flesh white, juicy acid, stone small, ripe 10th July.

OHIO BEAUTY.—Fruit below medium size, colour pale red, flesh yellowish, juicy, sweet, and pleasant, ripe 10th July.

SHADOW AMARELLE.—Fruit of medium size, round, flattened, colour yellowish red, flesh yellowish white, firm, crisp, juicy, and pleasantly acid, ripe 13th July.

DEACON.—Fruit very large, heart shaped, colour dark red, flesh reddish white, firm, juicy, sweet, sprightly, and very fine, ripe 10th July.

AMARELLE HATIVE.—Fruit above medium in size, round, flattened, colour deep red, flesh very juicy, sprightly, pleasant acid, stone very small, ripe 9th July.

DE PLANCHONRY.—Fruit above medium size round, colour deep red, flesh juicy, tender, mild, pleasant acid, very handsome, but perhaps too soft for shipping long distances, ripe 7th July.

Thirty-seven varieties were added to the collection this spring.

DWARF ROCKY MOUNTAIN CHERRY.

These bushes produced a fair crop of fruit this year, of varying size some of them almost as large as the English Morello. The fruit is juicy, sweetish and more or less astringent, ripe last of August.

APRICOTS.

The apricot trees bloomed very freely this year, but the weather was very wet, and cold during the whole blooming period, and no fruit set. This fruit has never yet produced here satisfactory returns. The trees planted in the spring 1890-91 and 1892

are now large, with fine spreading tops, and most of them appear to be vigorous and healthy, they bloom freely, are not troubled with pests, and yet rarely produce fruit, trained against a wall they might possibly do better, but as an orchard fruit, they have not thus far been a success.

Twenty-one additional varieties were received from Germany, and five from United States nurseries last spring, and all have made a fair growth.

NECTARINES.

All of the nectarine trees on the level land were rather badly affected with curl leaf, as in the case of peaches, spraying with Bordeaux mixture has a prompt effect in arresting the spread of the disease.

The trees were sprayed before leafing, and again when the leaves were about half grown, and again when the fruit was as large as filberts.

The older nectarine trees blossomed freely this year, and the following varieties fruited.

EARLY VIOLET.—Fruit small, round, flat, with a shallow suture; colour of skin, yellowish green with a reddish cheek; flesh yellowish green, rich fine flavour, ripe, 24th Aug.

DOWNTON.—Fruit of medium size, round, flat; colour of skin, whitish green, with red cheek; flesh, greenish white, tender, juicy, fine flavour. Ripe, 28th Aug.

HARDWICK.—Fruit medium to large, round, almost oval; colour of skin, light green, with a dull red cheek; flesh, greenish white, reddish at the stone, juicy, pleasant flavour. Ripe, 30th Aug.

PEACHES.

A large number of the peach trees produced fruit this year. In some cases a fair crop, and in others only a few specimens.

The trees were sprayed with Bordeaux mixture just before leafing out, again when the leaves were about half grown, and again later on in the season.

The curl leaf attacked several varieties, but the Bordeaux mixture appears to be a successful remedy for this disease, for although last spring was a favourable season for the growth of fungi, the curl leaf was not so bad as in 1894, and readily yielded to the Bordeaux spray.

As heretofore the trees on the upper benches, both nectarine and peach, escaped the curl leaf entirely.

The following is the order of ripening:

AMSDEN, ALEXANDER, EARLY CANADA.—These three varieties are very similar in nearly every respect. Form, almost globular, with shallow suture; skin, greenish yellow, dotted and splashed with red. Flesh, whitish, juicy, sweet and very good. Ripe, 4th August.

EARLY YORK.—Fruit, medium in size; colour, greenish white with dull red in the sun. Flesh, whitish, juicy, sprightly, rich, good. Ripe on bench, 4th Aug. Ripe on level 10th Aug.

HILBORN.—Fruit, medium in size, globular, moderate suture. Colour, creamy yellow, with red cheek. Flesh, juicy, tender, fine flavour. Ripe, 17th August. One of the best peaches for this locality.

HALE'S EARLY.—Fruit of medium size, round, with moderate suture, very similar to Hilborn, but not so juicy. Ripe, 17th August.

WATERLOO.—Fruit of medium size; flesh whitish, juicy, sweet, and of good quality. Ripe, 17th August.

GENERAL TAYLOR.—Fruit very large, white, with a red cheek, and dots of red sprinkled over nearly the whole surface; flesh white, juicy, sprightly, very fine quality. Ripe, 17th August.

CRANE'S EARLY YELLOW.—Fruit of medium size; colour of skin, creamy white, with red on sunny side; flesh yellowish, juicy, sprightly, pleasant flavour. Ripe, 18th August.

LEWIS SEEDLING.—Medium size, round, with deep suture; colour, orange, nearly covered with red; flesh yellow, sweet, juicy, rich, fine flavour. Ripe, 20th August.

EARLY TOLEDO.—Fruit large, round, with deep suture; colour, creamy white, with red on sunny side; flesh whitish, juicy, sprightly, pleasant flavour. Ripe, 21st August.

PRINCESS OF WALES.—Fruit above medium size, round with shallow suture; colour, creamy white, with dots and splashes of red; flesh whitish, juicy, melting, very fine flavour. Ripe, 22nd August.

EARLY BEATRICE.—Fruit small; colour whitish with a mottled red cheek; flesh juicy, melting, very fine quality. Ripe, 22nd August.

EARLY RIVERS.—Fruit rather large; colour whitish with a light red cheek; flesh juicy melting, very high quality. Ripe, 24th August.

LARGE EARLY YORK.—Fruit above medium size; colour white, with a deep red cheek; flesh whitish, juicy, pleasant, fine flavour. Ripe, 26th August.

COOLIDGE'S FAVOURITE.—Fruit medium size; colour, white, with dots, and splashes of red, nearly all over the surface; flesh white, juicy, pleasant flavour, good. Ripe, 27th August.

GEORGE IV.—Fruit large; colour white, with red cheek; flesh nearly white, juicy, rich flavour. Ripe, 28th August.

MOUNTAIN ROSE.—Fruit of medium size, with deep suture, colour, yellowish, with a bright red cheek. Flesh whitish, very juicy and of pleasant flavour; quality very good. Ripe, 28th August.

YELLOW ST. JOHN.—Fruit of medium size, with a shallow suture. Colour, rich yellow with a bright red cheek. Flesh, yellow, juicy, sweet; quality good. Ripe, 30th Aug.

REED'S EARLY GOLDEN.—Fruit large; colour, yellow, with dots and splashes of bright red. Flesh, deep yellow, juicy, sweet and very good. Ripe, 1st Sept.

MARY'S CHOICE.—Fruit small, nearly globular, shallow suture. Colour of skin, greenish yellow, with a red cheek. Flesh, greenish-white, juicy, sprightly. Ripe, 2nd Sept.

SNOW'S ORANGE.—Fruit of medium size, nearly round, sides unequal, rather deep suture. Colour, creamy with blush on cheek. Flesh, yellow, sweet, juicy, high flavoured, quality very good. Ripe, 2nd Sept.

BARNARD'S NEW RARE RIPE.—Fruit of medium size, with a shallow suture. Colour of skin, rich yellow, almost covered with dots and splashes of deep red. Flesh, deep yellow, fine grained, juicy, rich and high flavoured; quality very good. Ripe, 2nd Sept.

PRATT.—Fruit of medium size, nearly round, with a deep suture. Colour of skin, nearly covered with red. Flesh rich yellow, juicy, sweet, pleasant flavour. Ripe, 3rd Sept.

FOSTER.—Fruit large and handsome, sides somewhat unequal, deep suture; colour of skin golden yellow nearly covered with dots and splashes of bright red. Flesh yellow, tender, very juicy, pleasant flavour, quality fair. Ripe, 4th September.

GOLDEN RARE RIPE.—Fruit small to medium in size, round, with a moderate suture; colour of skin golden yellow, freely dotted and splashed with red. Flesh yellow, tender, fine grained, juicy and sprightly. Ripe, 4th September.

EARLY BARNARD.—Fruit of medium size, nearly round, sides somewhat unequal; colour of skin, greenish yellow, nearly covered with deep dull red. Flesh, pale yellow, juicy, sweet. Quality good. Ripe, 4th September.

EARLY CRAWFORD.—Fruit large, nearly globular, shallow suture, colour of skin yellow, shaded with bright red. Flesh yellow, juicy, pleasant flavour; good quality. Ripe, 4th September.

RED CHEEK MELOCOTEN.—Fruit medium size, sides unequal, with a deep suture; colour of skin, deep yellow, nearly covered with splashes and dots of red. Flesh finegrained, yellow, juicy, rich and sweet. Ripe, 5th September.

VIOLET HATIVE.—Fruit small, nearly globular, moderate suture; colour of skin, greenish yellow, considerably dotted and splashed with red. Flesh nearly white, juicy, sprightly, tender, good quality. Ripe, 5th September.

Noblesse.—Fruit large, nearly globular, with well defined suture; colour of skin, whitish, with a red cheek, and dots of red over nearly the whole surface. Flesh, whitish, sweet, very juicy, and pleasant flavour. Ripe, 15th September.

Muir.—Fruit small, nearly globular, with shallow suture. Colour of skin, golden yellow. Flesh yellow, tender, juicy, sweet and of pleasant flavour. Ripe, 20th Sept.

Gudgeon.—Fruit of medium size, oval shape, with shallow suture. Colour of skin, greenish yellow, streaked and dotted with red. Flesh, white, fine grained, tender, juicy and sweet. Ripe, 24th September.

Hance's Golden.—Fruit small, shallow suture, sides somewhat unequal. Colour of skin, yellow, with light red cheek. Flesh firm, juicy, sprightly, pleasant flavour. Ripe, 24th September.

Jacques Rare Ripe.—Fruit small, nearly round, shallow suture. Colour of skin, yellow. Flesh yellow, rich pleasant flavour, not juicy. Ripe, 28th September.

Golden Drop.—Fruit of medium size with a deep suture and unequal sides. Colour of skin, golden yellow. Flesh, yellow, sweet and tender, but not juicy. Ripe, 28th September

Lonoke.—Fruit of medium size, with a deep suture. Colour of skin, yellow. Flesh, coarse and dry, not high flavoured. Ripe, 28th September.

Cooley's Mammoth.—Fruit of medium size, nearly globular, with a deep suture. Colour of skin, bright golden yellow with a reddish blush. Flesh, yellow, juicy, sprightly but slightly astringent. Ripe, 28th September.

Barrington.—Fruit, medium to large, globular, sides unequal with a moderate suture. Colour of skin, creamy yellow, with light red splashes on sunny side. Flesh, white, sweet, tender, juicy, good quality. Ripe, 29th September.

Amelia.—Fruit of medium size, oblong, with a shallow suture. Colour of skin, yellow, with a faint reddish blush. Flesh, white, juicy, sprightly; quality, medium. Ripe, 29th September.

Willet.—Fruit large, nearly round, with a deep suture. Colour of skin, greenish yellow, with dots and splashes of red. Flesh, whitish, firm, moderately juicy, sweet. Ripe, 30th September.

Sea Eagle.—Fruit small, round, flattened: colour of skin, golden, with bright red cheek; flesh yellow, firm, juicy, sweet. Ripe, 30th September.

Druid Hill.—Fruit small, globular, shallow suture; colour of skin, yellow, freely sprinkled with small red dots; flesh greenish white, sweet and of pleasant flavour. Ripe, 30th September.

Hill's Chili.—Fruit of medium size, shallow suture; sides very unequal; colour of skin, rich yellow with splashes of bright red; flesh yellow, coarse, juicy, pleasant flavour. Ripe, 30th September.

Chair's Choice.—Fruit of medium size, globular with a shallow suture; colour of skin, yellow, with a deep red cheek; flesh yellow, firm, sweet, not juicy. Ripe, 30th September.

Moore's Favourite.—Fruit of medium size, globular, with a shallow suture nearly all around the fruit; colour of skin, greenish white with a reddish cheek; flesh white, juicy, sprightly. Ripe, 30th September.

Marshall's Late.—Fruit of medium size, oblong, with a shallow suture, one side considerably larger than the other; colour of skin, yellow, with small reddish dots; flesh coarse, dry and of poor quality. Ripe, 30th September.

Fox's Seedling.—Fruit of medium size, nearly globular, with moderate suture; colour of skin, greenish white, with faint blush on cheek; flesh white, juicy, pleasant flavour. Ripe, 2nd October.

The following varieties fruited but did not fully ripen their fruit.

Wheeler's Late, Old Mixon Cling, Arkansas Mammoth Cling, Topaz, Burke, Good, Bequett Cling, Indian Blood, Heath Free, Normand's Choice, Keyport White, Hughs I. X. L., Shipper's Late, Lemon, Salway, Ward's Late, Lovet's White, Levy's Late, Late Crawford.

Fifteen varieties of peaches, some American and others from Europe, were added to the collection during the past season. Owing to the dry autumn the new wood has been

thoroughly ripened, and if the coming winter and spring should be favourable, we may expect a good crop of peaches next year.

Peach trees on the Experimental Farm began fruiting in 1891, and from the experience with many of the best known varieties, the following appear to be the best adapted for the coast region on account of their earliness of ripening and productiveness, and also because many of the earlier varieties are the latest in blooming. Early Canada, Amsden, Alexander, Hilborn and Early Silver.

Early Crawford has as yet only produced a few specimens on two or three occasions.

MEDLARS.

The Nottingham and Royal Medlars, each bore a few specimens this year, the fruit of both varieties is small and not yet in condition for use. Four additional varieties were received from Germany last spring.

QUINCES.

The quince bushes that were planted in the spring of 1890 bloomed freely this year, but only a few quinces formed, and these fell off before ripening. Five additional varieties of quinces were received from Germany last spring, all are living and thrifty.

MULBERRIES.

The following varieties of mulberries fruited this year.

New American, Downing's Everbearing, Hick's Everbearing, Russian,

Black English, Victoria and Italian.

The fruit of most of the above varieties is very similar in appearance and taste.

Downing's Everbearing is the largest and best. These fruits are only fit for immediate home use, as they are too soft for shipping.

FIGS.

The figs are trained in bush form, and grow vigorously, and several varieties have produced fruit, but none have yet fully ripened.

NUTS.

The filberts, almonds and other nut-trees, have made a strong growth during the past season. The filberts did not fruit freely this year.

The hard shell almonds had a fair crop. The shell is very thick, and hard, and the kernel is small, and not of very good quality. One of the Spanish chestnut trees, produced a few nuts this year. Last year it had a large crop of burs but no nuts, this year, several had crops of burs, but only one,—the one which had burs last year—produced nuts; next year, if favourable, many of them may fruit.

The walnut, hickory, and butternut trees have grown well, but have not yet fruited.

One plant each, of 46 additional varieties of nuts, chiefly filberts, were received, last spring most of them from Europe, and the others from the Central Experimental Farm, almost all have made a healthy growth.

There have been some inquiries made about filbert and other nut-trees, with a view to planting such as are most successful, in places where it is not practicable, to cultivate the soil and as all the walnuts, chestnuts, butternuts, and filberts planted on the Experimental Farm, have grown satisfactorily, very probably in the near future, waste lands in many parts of the country, may be turned to good account in this way.

GRAPES.

This has been a favourable season for grapes, the hot dry autumn ripening many varieties, that have not ripened in other seasons. Those planted on the bench land ripened from ten to fifteen days earlier than the same varieties in the vineyard in the valley.

The following varieties ripened before frost came :—

White or nearly White.

MARTHA.—Bunch large, compact, shouldered ; berry large, white, pleasantly acid ; productive. Ripe, 10th October.

NIAGARA.—Bunch very large, shouldered ; berry large, yellowish-green, sweet, tender and of pleasant flavour ; very productive. Ripe, 16th October. Ripe on bench, 6th October.

JESSICA.—Bunch small, open, shouldered ; berry, greenish-white, sweet, juicy and of a pleasant flavour ; not very productive. Ripe, 10th October. Ripe on bench, 29th September.

POCKLINGTON.—Bunch small, loose, shouldered ; berry medium, pulpy, sprightly, pleasant taste ; productive. Ripe, 23rd October. Ripe on bench, 12th October.

LADY.—Bunch small and loose ; berry large, yellowish-white, tender, juicy, sweet ; not productive. Ripe, 7th October. Ripe on bench 28th September.

STORR'S EARLY.—Bunch small and compact ; berry greenish-white, small, juicy, sweet and of pleasant flavour ; productive. Ripe, 1st October.

EVA.—Bunch medium in size and loose ; berry, medium, juicy and sweet ; productive. Ripe, 9th October.

NOAH.—Bunch medium in size and compact ; berry of medium size, rather acid, juicy ; productive. Ripe, 28th October.

DUCHESS.—Bunch long, shouldered and loose ; berry medium in size, sweet, juicy and of good flavour ; not productive. Ripe 7th October.

CENTENNIAL.—Bunch small and loose ; berry, small, pulpy, acid ; not productive. Ripe, 16th October.

LADY WASHINGTON.—Bunch large, shouldered and loose ; berry of medium size, juicy, rather acid ; productive. Ripe, 24th October.

SAUNDERS' SEEDLING No. 3.—Bunch small, cylindrical and compact ; grape, small, tender, sweet, juicy and of pleasant flavour; productive. Ripe, 8th October.

ELVIRA.—Bunch medium in size and compact ; berry, small, juicy, tender, sprightly and pleasant to the taste ; productive. Ripe, 28th October. Ripe on bench, 13th October.

EMERALD.—Bunch medium in size, cylindrical, compact ; berry, small, tender, sweet and very good ; productive. Ripe, 8th October. Ripe on bench, 20th September.

MISSOURI REISLING.—Bunch medium in size and compact ; berry, small, juicy, sprightly, tender and pleasant ; productive. Ripe, 16th October.

ELDORADO.—Bunch large, compact and shouldered, somewhat pulpy, sweet, skin thick ; productive. Ripe, 16th October.

SAUNDERS' SEEDLING.—(Wild Seedling with Muscat Hamburg.)—Bunch small and compact ; berry small, juicy, sweet and tender ; productive. Ripe, 10th October.

ROMMEL.—Bunch medium in size ; berry, medium size, juicy, sprightly, tender, pleasant taste ; productive. Ripe, 12th October.

SAUNDERS' SEEDLING, (Wild Seedling with Muscat d'Aout)—Bunch compact and shouldered ; berry, medium in size, oval in shape, juicy, sprightly, tender and pleasant ; productive. Ripe, 24th October. Ripe on bench, 12th October.

OPAL.—Bunch small, loose and shouldered ; berry, small, sour, of poor quality ; not productive, not ripe, 30th October ; too late for this climate.

Black.

CONCORD.—Bunch large, fairly compact and shouldered. Berry large, tender, juicy, sprightly ; productive. Ripe 16th October. Ripe on bench 2nd October.

CANADA.—Bunch small, loose and open. Berry, small, sprightly, sweet; not very productive. Ripe 10th October.

WILDER.—Bunch large, compact and shouldered. Berry large, juicy, and sweet; fairly productive. Ripe 16th October.

MOORE'S EARLY.—Bunch small and loose. Berry large, sweet, rather pulpy, skin tough; not productive. Ripe 10th October.

HARTFORD.—Bunch large, loose and shouldered. Berry large and round, sweet, drops when nearly ripe; productive. Ripe 20th October.

SEEDLING CLINTON WITH MUSCAT, HAMBURG.—Bunch small and loose. Berry small and acid; not productive. Ripe 30th October.

EARLY VICTOR.—Bunch small and loose. Berry small, sweet, pulpy, good flavour; productive. Ripe 7th October.

NAOMI.—Bunch small, loose and shouldered; berry small, acid; not productive. Ripe 17th October.

BACCHUS.—Bunch small and loose; berry, small, juicy, pleasant; not productive. Ripe 4th October. Ripe on bench 22nd September.

FLORENCE.—Bunch small, loose and shouldered; berry small and sweet, with a foxy flavour; not productive. Ripe 7th October.

IMPROVED WILD.—Bunch medium in size, loose and straggling; berry, small medium, juicy, sprightly; not productive. Ripe 8th October.

ARNOLD'S NO. 8.—Bunch small and loose; berry medium in size, acid; skin, thick; not productive. Ripe 26th October.

MARION.—Bunch small with many imperfect berries; berry, small, acid, of poor quality; not productive. Ripe 20th October.

CYNTHIANA.—Bunch, medium in size, loose and sometimes shouldered; berry, small, acid, of inferior quality; productive. Ripe 8th October.

COTTAGE.—Bunch small and loose; berry large, pulpy, sweet, and of fair flavour; not productive. Ripe 7th October.

EUMELAN.—Bunch medium in size, loose, shouldered; berry of medium size: flesh, tender and sweet, good quality; not productive. Ripe 28th October.

MERRIMAC (Roger's No. 19).—Bunch medium in size; berry large, juicy and a little pulpy, sweet and of good flavor; productive. Ripe 12th October.

ARNOLD'S NO. 2.—Bunch small and loose; berry small, acid, and inferior in quality; not productive. Ripe 30th October.

IVE'S SEEDLING.—Bunch medium in size, loose, and shouldered; berry medium in size, acid; skin thick; productive; too late for this climate; not quite ripe 31st October.

TELEGRAPH.—Bunch medium in size, compact and shouldered; berry medium size, juicy, a little pulpy, sprightly; productive. Ripe 20th October.

ROGER'S NO. 41.—Bunch large, compact and shouldered; berry large, pulpy, pleasant flavor, skin thick; productive. Ripe 24th October.

HIGHLAND.—Bunch large, loose and shouldered; berry medium in size, sprightly, pulpy, but pleasant; productive. Ripe 25th October.

MILLS.—Bunch large, loose and shouldered; berry medium in size, juicy, sprightly, fine flavour; productive. Ripe 24th October.

ROGER'S NO. 24.—Bunch large, compact and shouldered; berry large, pulpy, sprightly, skin thick and tough, pleasant flavour; productive. Ripe 16th October.

ORIENTAL.—Bunch large, loose, shouldered; berry large, juicy, somewhat pulpy, sprightly, of fair quality; skin, thick; productive. Ripe 20th October.

CLINTON.—Bunch medium in size and compact; berry small, tender, sprightly; productive. Ripe 16th October.

HERBERT (Roger's No. 44).—Bunch long but somewhat loose; berry large, juicy, sprightly; productive. Ripe 16th October.

ROGER'S NO. 39.—Bunch medium in size and loose; berry large, sweet and pulpy; skin thick and tough; productive. Ripe 10th October.

SAUNDERS' SEEDLING, Concord with Delaware.—Bunch small and compact; berry small, juicy, sprightly, pleasant and of good flavour; productive. Ripe 20th October.

SAUNDERS' SEEDLING, Clinton with Muscat, HAMBURG.—Bunch medium in size and compact; berry medium, pulpy, sprightly, rather acid; productive. Ripe 20th Oct.

Red and Reddish Grapes.

DELAWARE.—Bunch medium, compact and shouldered; berry small, sweet and of pleasant flavour; productive. Ripe 4th October.

AMBER QUEEN.—Bunch medium in size, loose, shouldered; berry medium, sweet, juicy, skin tender, not very productive. Ripe 20th October.

MASSASOIT.—Bunch large, loose and shouldered; berry large, juicy, sweet and tender; productive. Ripe 20th October.

AUGUST GIANT.—Bunch large and loose; berry large reddish purple, juicy, acid, poor flavour; not productive. Ripe 20th October.

ROGER'S NO. 28.—Bunch large, compact and shouldered; berry large, reddish purple, juicy, pleasant acid; productive. Ripe 20th October.

AGAWAM.—Bunch medium to large, moderately compact, shouldered: berry large, reddish purple, tender, juicy and of pleasant flavour; productive. Ripe 20th October.

GAERTNER (Roger's No. 14).—Bunch large, compact and shouldered: berry large, light reddish purple, tender, juicy, sweet and of pleasant taste, skin tough; productive. Ripe 20th October.

LINDLEY (Roger's No. 9).—Bunch large, loose and shouldered; berry large, reddish amber, juicy, sweet of good flavour; productive. Ripe 18th October.

BRIGHTON.—Bunch large and fairly compact, sometimes shouldered; berry large, reddish amber, juicy, sweet, fine flavour; productive. Ripe 20th October.

SALEM (Roger's No. 53).—Bunch large, compact and shouldered; berry large, juicy, tender, of good quality; productive. Ripe 19th October.

ROGER'S NO. 5.—Bunch medium in size and loose; berry large, reddish purple, sprightly, sweet and juicy, skin thick and tough; productive. Ripe 7th October.

VERGENNES.—Bunch medium in size, loose and shouldered; berry large, reddish purple, pulpy, sweet and of pleasant flavour; productive. Ripe 10th October.

MOYER.—Bunch small and loose; berry small, sweet, juicy and pleasant, not very productive. Ripe 6th October.

WYOMING.—Bunch large, compact, and shouldered; berry medium in size, juicy, and pleasant but drops from the vine as soon as ripe. Ripe 7th October.

ARNOLD'S NO. 1.—Bunch large, loose, and shouldered; berry large, quite acid, skin tough; productive. Ripe 20th October.

ULSTER.—Bunch medium in size, compact, and shouldered; berry medium, sweet, juicy, and of good flavour; productive, feeble grower. Ripe 10th October.

JEFFERSON.—Bunch medium in size, shouldered; berry medium, too late to ripen here; not productive; not quite ripe 30th October.

BUCHANAN.—Bunch small, compact, and shouldered: berry small, juicy, sprightly, and pleasant, skin thin and tender; productive. Ripe 12th October.

CHASSELAS DE FONTAINBLEAU.—Bunch small, and loose; berry medium in size, reddish yellow, pulpy, sweet, and pleasant; not productive. Ripe 14th October.

BRILLIANT.—Bunch long, loose, and shouldered: berry medium size sweet, juicy, and tender, skin rather thick; productive. Ripe 10th October.

CURRANTS RED AND WHITE

The red and white currants fruited heavily this year, and the fruit was large, and very fine.

The finest red currant fruited up to the present time, is La Fertile, the bunch is not as long as some others, but the berry is large and even throughout, and the flavour is very fine, mild, sprightly and sweet. La Fertile, London Red, La Conde and Victoria, in the order named, are the choice of the red currants, as tested here, thus far.

Sixteen additional varieties of red currants were received from Germany last spring, all these are alive, and are growing well.

White currants.—White Transparent is the best of the white currants which have been tested. The bush is vigorous and productive, and the bunch is long, well filled with large currants of very fine quality.

Ten additional varieties of white currants were received last spring, and having made a vigorous growth, give promise of fruiting next year.

BLACK CURRANTS.

There were very few black currants this year, and most of those we had were injured by a small white grub.

The Prince of Wales is one of the best, the stems are long, the berry large and of a mild pleasant flavour.

Of the black currants tested, the Prince of Wales, Monarch, Eclipse, Pearce, Ethel, Ontario, and Ogden's Black, are the best, vigour and productiveness, of bush, and size, evenness of berry, and length of the bunch, all being considered. All are Saunders' seedlings except the first, and last, on the list.

Six additional varieties of black currants were received from Germany, and five new seedlings from the Central Experimental Farm, last spring. All are in vigorous condition.

GOOSEBERRIES.

The only gooseberries free from mildew this year, were those raised on the mountain, and the Downing and Houghton on the level land.

The bushes were sprayed with Bordeaux mixture just before the buds burst, again when the first leaves were about half grown and twice at intervals later in the season, but both fruit and foliage were very badly attacked by the mildew, after having given the Bordeaux mixture a careful test for several seasons, and evidently no prospect of success it is intended to try the lime, sulphur and salt mixture, just before leafing next spring, and some other preparations of sulphur later.

Thirty-five varieties were received from Germany last spring, these have made a fair growth this year, and have shown no mildew, and efforts will be made to prevent an attack.

BLACKBERRIES.

All the blackberries reported as having fruited in 1895, fruited again this year, but the crop was very light, and the berries small, owing to the very unfavourable season. Of all the varieties fruited and reported on, in previous years, the best market sorts are Agawam, Taylor, Snyder and Erie. Last year Maxwell was promising in quality, size, and productiveness, but this year it appeared to suffer more than the above-named varieties, which may be accounted for by the canes being on dry gravelly land.

A new plantation of all the old varieties, as well as those received during the past season has been made, and under more favourable circumstances the Maxwell may prove to be a valuable sort. The collection here now consists of 32 different varieties.

RED AND YELLOW RASPBERRIES.

No new varieties were fruited this year. All those reported on last year bore a small crop, but on account of the drought, the berries were small. The Cuthbert is the most profitable red berry, the Fillbasket, is larger and equally as good in quality, but not quite so productive. All Summer, is also a fine berry, and continues bearing considerably longer than any other sort yet fruited. Champlain and Golden Queen are the best and most productive of the yellow raspberries. Thirty-eight additional varieties of raspberries have been received this spring. Nearly all of these have grown well.

BLACK RASPBERRIES.

None of the new additions to the collection of this fruit bore this year, and the season was so hot and dry, that there were really no good berries produced.

Hopkins, Winona and Gault, black raspberries, and a yellow cap, are the addition to this class of raspberries this year.

STRAWBERRIES.

The cold and wet weather which prevailed during the blossoming period, prevented the thorough fertilization of many of the varieties of strawberries, and later the drought interfered with the growth of the berry. The crop was light, and there were many imperfect and misshapen berries.

A number of new berries were added to the collection this year.

The following is the order of ripening of all those that produced fruit this year.

Alexander II	June	6th.	Maxwell	June	15th.
Daisy	"	6th.	Bonny Lass	"	15th.
Hautbois	"	6th.	Alpha	"	16th.
Iowa Beauty	"	7th.	Eclipse	"	16th.
Van Deman	"	8th.	Beverly	"	16th.
Warfield	"	8th.	Yale	"	17th.
Omega	"	8th.	Pine Apple	"	17th.
Smith's Seedling	"	8th.	Improved Jacunda		17th.
Chairs	"	9th.	Parker Earle	"	18th.
Beder Wood	"	9th.	Sir Jos Hooker	"	20th.
Dr. Hogg	"	10th.	Empress Eugenie	"	20th.
Dayton	"	10th.	Greenville	"	20th.
Windsor Chief	"	11th.	Laxford Hall	"	22nd.
Phillip's Seedli'g	"	14th.			

A large number of plants of the best of these were distributed in packages of a dozen each to settlers in different parts of the province, for trial, and some, which were not very productive with us, have proved to be superior varieties in other locations where soil and climatic conditions were different.

Warfield, Iowa Beauty, Omega, Improved Jacunda, Greenville, Beverly, and Windsor Chief, have proved the best varieties this year, in the order named.

The following is a list of the new additions :—Weston, Mary, Brandywine, Anna Kennedy, Michigan, H. W. Beecher, Kentucky, Shuckless, Moore's Early, Crawford, Woolverton, Marshall, Wonder, Michel's Early, Great Pacific, Clarke's Early, Lovett's Early, Sterling, Smeltzer's Early, Glendale, Enhance, Speece's Perfect, Eleanor, Lovett, Early, Gardner, Bissel, Timbrell, Arrow, Tubbs, Staples, Brunette, Shuster's Gem, Tennesse Prolific, Australian Everbearing, Annie Laurie, Regina, Beebe's Seedlings, No. 1, No. 2, No. 3.

Additions to the collection of Fruits.

A very large addition has been made to the collection of fruits for testing during the past season as follows :—

Apples, 253 varieties.	Blackberries, 8 varieties.
Pears, 171 "	Raspberries, 34 "
Peaches, 19 "	Red and White Currants, 36 varieties.
Plums, 91 "	Quinces, 5 varieties.
Apricots, 24 "	Medlars, 4 "
Cherries, 51 "	Filberts and other nuts, 46 varieties.

Making a total of 696 varieties of fruit and 46 varieties of nuts.

There are now in the collection of tree fruits 1,886 named varieties as follows :—

Apples, 849.	Cherries, 122.
Pears, 334.	Nectarines, 17.
Peaches, 197.	Quinces, 17.
Plums, 278.	Medlars, 7.
Apricots, 59.	Mulberries, 6.

Which, with the large number of grapes, figs, gooseberries, currants, raspberries, blackberries and strawberries, brings the total number of named varieties of fruits

growing on the farm at the present time to nearly three thousand. This is believed to be by far the largest collection of cultivated fruits growing on any one place in the world, and the experience which will be gained by observing the peculiarities of form, productiveness, quality and adaptability to the climate of the individuals composing this large collection, must in the future, prove of great benefit to the settlers in this country.

TOBACCO.

A package of seed of two varieties of Havana tobacco was received from the Commissioner of Dominion Lands, Winnipeg, Man., late last spring. They were sown in a hot bed and transplanted as soon as ready. The plants made a vigorous growth, but as it was so late before the seed was received, the plants were late. At the close of the season they were cut and the leaf is being cured, but they do not appear to be as well matured as the tobacco grown last year.

The seed should be sown here in March so that the plants would be well grown and strong by the time the weather was suitable for transplanting. These seeds were supplied by Mr. J. R. Gordon of New York, who is an expert in tobacco, and I append a copy of his opinion of the leaf raised last year which was not received in time to be included in the report for 1895.

PIER 24, EAST RIVER, N.Y., 28th Nov., 1895.

The Agassiz sample was received in fair condition, and after moistening, I was able to examine it very minutely. It is clear to my mind that for this sample the best leaves were picked from several different plants, as they are of excellent quality. Of the leaves enclosed in this Agassiz package four would certainly pass as A 1 wrappers, and the remainder would go as wrappers, although not so fine as the others. The beauty of the leaf I find consists in its silky texture, its freedom from blemish, and its very fine veins. The colour is also good, but it would have been better had the plant been allowed to ripen more. Because the leaf is small is no fault. Havana cannot rank with the other varieties for size and weight, and a fine leaf rather than a large one is the point at which Connecticut Valley growers of 30 years experience are now striving for. It has been proved that the smaller varieties of tobacco are the most profitable, in that they find a quicker market and sell at a price sufficiently higher to offset the greater weight of the coarser varieties which must wait for a market, and then be disposed of at a low figure. To make myself plain, I might put it in this way: That while from a certain acreage where two tons of the coarser varieties were produced, of the finer varieties the yield might be only one and one half tons, and this one and one half tons of fine tobacco would bring a greater return of money than the two tons of coarse tobacco.

But to sum up the matter, I do not think the Agassiz people have any reason to be dissatisfied with the experiment, and it is proved to my mind that in certain districts of British Columbia tobacco can be raised to rank with any produced in the States. Of course it must have careful treatment to ensure success.

J. R. GORDON.

SEED DISTRIBUTION.

There were distributed from this farm to farmers who applied from different parts of the province during 1896, the following 3 lb. bags of cereals and potatoes :—

Fall Wheat	24
Spring Wheat	41
Barley	75
Pease	84
Oats	71
Potatoes	38
Total	333

Also packages of strawberry plants, 292 ; scions and cuttings, 64.

BUILDINGS.

Since my last report, a comfortable poultry house has been built, and yards for the different breeds of fowls are being fenced as opportunity offers. They will be completed early in the new year.

The poultry will no doubt do much better in their new quarters than in the old building, which was near the timber, where they suffered from hawks, skunks and minks which carried off the chickens.

STOCK.

The stock has done well during the past season. There is no sickness or disease to report, and only one death, that of one of the Dorset-Horned rams, killed while fighting with another ram. Two Holstein calves, one Ayrshire calf and two Short-Horn calves, is the increase in horned stock on the Experimental Farm during the year.

The Tamworth sow farrowed nine pigs, and the Berkshire sow farrowed four pigs.

Two Dorset-Horned lambs comprise the increase in sheep. One of last year's ram lambs has been sold.

There have been many inquiries for young pigs and bull calves for breeding purposes.

METEOROLOGICAL RECORD.

1896–96.	Highest Temperature.		Lowest Temperature.		Rainfall.	Snowfall.	Sunshine.	
	Date.	Deg.	Date.	Deg.	Inches.	Inches.	Hrs.	Min.
December, 1895	14th	53	17th	11	10·74	40	38	45
January, 1896	9th	49	15th	10	7·17	17	29	24
February	20th	60	29th	20	11·25	4	49	12
March	22nd	60	2nd	16	3·58	6	124	48
April	4th	66	3rd	28	5·29	....	107	54
May	29th	83	8th	34	4·62	....	159	42
June	26th	95	2nd	39	2·86	....	204	54
July	16th	90	12th	43	·03	....	209	54
August	12th & 21st	93	27th	45	·38	....	184	48
September	3rd	80	7th	32	2·19	....	135	06
October	15th	75	26th	32	6·34	....	117	18
November	1st	58	27th	9	9·02	$8\frac{1}{2}$	55	42
Total	....	....	......	...	63·47	$75\frac{1}{2}$	1417	27
Total for 1895	....	....	......	...	70·61	$30\frac{3}{4}$	1299	24
Rainfall for June, July, August and Sept. in 1894	....	....	......	....	15·28			
do do do 1895	....	....	......	....	10·79			
do do do 1896	....	....	......	....	5·46			

I have the honour to be, sir,

Your obedient servant,

THOS. A. SHARPE.

STATEMENT OF EXPENDITURE ON THE DOMINION EXPERIMENTAL FARMS, FOR THE YEAR ENDING 30TH JUNE, 1896.

CENTRAL EXPERIMENTAL FARM—EXPENDITURE, 1895–96.

Live stock	$ 65 05
Feed for stock, including veterinary services	909 32
Seed grain, seeds, trees, &c	1,576 93
Implements, tools, hardware and supplies	639 10
Drainage and drain tiles	77 25
Manure and fertilizers	558 47
Travelling expenses	922 42
Exhibition expenses	271 42
Blacksmithing, harness supplies and repairs	492 66
Bee supplies	392 75
Salaries	1,766 40
Wages, farm work, including experimental work with grain and other farm crops; also, salaries of farm foreman and director's assistant in experimental work	6,241 91
Wages, care of stock	2,448 55
Chemical department	742 15
Botanical and Entomological Department	1,124 06
Horticultural department	4,001 67
Poultry department	1,529 52
Forestry department and care of grounds	1,973 41
Arboretum	761 23
Office help, correspondence branch and messenger service	2,705 37
Printing and stationery	687 84
Seed testing and care of greenhouses	907 78
Dairy department	775 63
Contingencies, including meteorological observations, $42.00	127 08
" books and newspapers	93 79
" telegrams and telephones	147 75
	$ 31,939 51

EXPERIMENTAL FARM, NAPPAN, N.S.—EXPENDITURE, 1895–96.

Live stock	$ 33 05
Feed for stock, including veterinary services	79 99
Seed grain, seeds, trees, &c	162 56
Implements, tools, hardware and supplies	249 13
Draining and drain tiles	150 17
Manure and fertilizers	444 49
Travelling expenses	180 90
Blacksmithing, harness supplies and repairs	93 51
Salaries, including proportion of salaries for general work, Ottawa	2,705 86
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	1,675 18
Wages, care of stock	842 10
Chemical department	432 92
Botanical and Entomological department	376 25
Forestry department	71 00
Office help	20 00
Seed grain distribution	118 06
Contingencies, (including postage, $51.48)	57 59
" printing and stationery	1 35
" books and newspapers	20 12
" telegrams	53
	$ 7,714 76

EXPERIMENTAL FARM, BRANDON, MANITOBA—EXPENDITURE 1895-96.

Live stock	$ 154 70
Feed for stock, including veterinary services	81 80
Seed grain, seeds, trees, &c	269 92
Implements, tools, hardware and supplies	382 21
Travelling expenses	144 30
Exhibition expenses	115 58
Blacksmithing, harness supplies and repairs	226 86
Salaries, including proportion of salaries for general work, Ottawa	2,430 40
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	3,369 46
Wages, care of stock	650 00
Chemical department	432 93
Botanical and Entomological department	376 25
Forestry	431 25
Poultry department	64 92
Office help (including delivery of mail, $111)	265 50
Seed-grain distribution	412 72
Tree distribution	292 86
Contingencies, (including postage, $65)	98 40
" printing and stationery	43 69
" books and newspapers	39 75
" telegrams and telephones	37 82
	$10,321 42

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.—EXPENDITURE 1895-96.

Live stock	$ 72 55
Feed for stock, including veterinary services	276 68
Seed grain, seeds, trees, &c	159 50
Implements, tools, hardware and supplies	318 64
Manure and fertilizers	132 75
Travelling expenses	125 80
Exhibition expenses	244 84
Blacksmithing, harness supplies and repairs	168 90
Salaries, including proportion of salaries for general work, Ottawa	2,430 40
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	3,187 64
Wages, care of stock	925 60
Chemical department	432 92
Botanical and Entomological department	376 25
Poultry department	34 60
Forestry department	344 80
Office help	450 00
Seed-grain distribution	483 20
Tree distribution	95 50
Contingencies (including postage $108.03	122 34
" printing and stationery	7 49
" books and newspapers	26 35
" telegrams	2 65
	$ 10,419 80

EXPERIMENTAL FARM, AGASSIZ, B. C.—EXPENDITURE, 1895-96.

Live stock	$ 57 15
Feed for stock, including veterinary services	34 65
Seed grain, seeds, trees, &c	617 71
Implements, tools, hardware and supplies	268 50
Draining and drain tiles	2 25
Manure and fertilizers	87 28
Travelling expenses	154 80
Exhibition expenses	144 48
Blacksmithing, harness supplies and repairs	32 40
Salaries, including proportion of salaries for general work, Ottawa	2,430 40
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,978 84
Wages, care of stock	458 25
Chemical department	432 93
Botanical and entomological department	376 25
Poultry department	16 75
Forestry department	76 70
Office help	30 00
Seed grain distribution	94 05
Tree distribution	47 40
Clearing land	261 25
Contingencies (including postage, $56.39)	104 09
" printing and stationery	3 70
" books and newspapers	34 50
" telegrams	5 20
	$ 8,749 53

SUMMARY.

Central Experimental Farm		$31,939 51
Nappan "		7,714 76
Brandon "		10,321 42
Indian Head "		10,419 80
Agassiz "		8,749 53
Seed grain distribution		3,251 15
Forest tree and tree seed distribution		95 04
Printing bulletins and distribution of bulletins and reports	$ 5,008 79	
Less special sum in estimates for this item	4,000 00	
		1,008 79
		$73,500 00

SUMMARY OF STOCK, MACHINERY, IMPLEMENTS, &c., ON HAND 31st DECEMBER, 1896.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

16 Horses	$ 1,210 00
4 Ayrshire cattle	250 00
1 Devon "	50 00
2 Holstein "	175 00
7 Jersey "	435 00
18 Canadian "	479 00
36 Grade "	863 00
4 Yorkshire swine	64 00
8 Berkshire "	188 00
1 Essex "	15 00
5 Tamworth "	105 00
3 Poland China swine	36 00
3 Chester white "	40 00
39 Grade swine	157 00
Farm machinery	1,604 00
Farm implements	543 00
Vehicles, including farm wagons and sleighs	926 00
Hand tools, hardware and sundries	1,029 30
Harness	350 25
Dairy department, machinery, &c	760 85
Horticultural department, implements, tools, &c	141 95
Forestry " "	408 95
Botanical " "	7 50
Poultry " 314 fowls	439 50
" " implements, furnishings, &c	104 25
Bees and apiarian supplies	257 43
Chemical department, apparatus and chemicals	1,573 30
Books in the several departments	293 18
Greenhouse plants, supplies, &c	990 30
Office furniture and stationery	1,341 50
Furniture at Director's house	1,393 00
	$16,231 26

EXPERIMENTAL FARM, NAPPAN, N.S.

8 Horses	$ 360 00
3 Holstein cattle	50 00
1 Ayrshire "	20 00
22 Grade "	269 00
8 Yorkshire swine	34 00
6 Berkshire "	47 00
2 Tamworth "	20 00
14 Grade "	21 00
28 Fowls	14 50
13 Vehicles, including farm wagons and sleighs	340 75
Farm machinery	403 00
" implements	151 00
Hand tools, hardware and sundries	231 35
Harness	110 85
Furniture for office, reception room, and bedroom for visiting officials	308 90
	$ 2,381 35

EXPERIMENTAL FARM, BRANDON, MANITOBA.

10 Horses	$ 950 00
3 Ayrshire cattle	200 00
3 Durham "	200 00
4 Holstein "	325 00
8 Grade "	155 00
1 Polled Angus	75 00
3 Tamworth swine	58 00
3 Berkshire "	53 00
59 Fowls	47 00
Bees and apiarian supplies	78 20
Vehicles, including farm wagons and sleighs	546 00
Farm machinery	937 00
" implements	495 00
Hand tools, hardware and sundries	630 42
Harness	237 50
Furniture for reception room and bedroom for visiting officials	195 55
" supplies and books for office	206 30
	$ 5,388 97

EXPERIMENTAL FARM, INDIAN HEAD, N. W. T.

12 Horses	$ 1,365 00
9 Durham cattle	625 00
1 Polled Angus	50 00
12 Holstein cattle	727 00
16 Grade cattle	405 00
8 Yorkshire swine	85 00
12 Berkshire "	120 00
5 Tamworth "	70 00
74 Fowls	74 00
Bees and apiarian supplies	18 90
Vehicles, including farm wagons and sleighs	556 00
Farm machinery	1,259 00
" implements	700 00
Hand tools, hardware and sundries	694 40
Harness	232 50
Furniture for reception room and bedroom for visiting officials	309 75
" supplies and books for office	204 00
	$ 7,495 55

EXPERIMENTAL FARM, AGASSIZ, B.C.

6 Horses	$ 850 00
5 Durham cattle	400 00
5 Ayrshire "	250 00
5 Holstein "	400 00
1 Grade "	30 00
5 Dorset horned sheep	110 00
3 Berkshire swine	65 00
3 Tamworth "	130 00
29 Fowls	29 00
Bees and apiarian supplies	26 50
Vehicles, including farm wagons	255 00
Farm machinery	646 00
" implements	215 00
Hand tools, hardware and sundries	214 45
Harness	85 50
Furniture for reception room and bedroom for visiting officials	270 00
Furniture, supplies and books for office	110 00
	$ 4,086 45

W. H. HAY,
Accountant.

INDEX

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR and acting AGRICULTURIST - -	WM. SAUNDERS, LL.D.
HORTICULTURIST - - - - - - -	JOHN CRAIG
CHEMIST - - - - - - - -	F. T. SHUTT, M.A.
ENTOMOLOGIST and BOTANIST - - -	JAS. FLETCHER, LL.D
POULTRY MANAGER - - - - - -	A. G. GILBERT
FOREMAN OF FORESTRY - - - - -	W. T. MACOUN
SUPT. EXPERIMENTAL FARM, Nappan, N.S. - -	GEO. W. FORREST
HORTICULTURIST " " " - -	W. S. BLAIR
SUPT. EXPERIMENTAL FARM, Brandon, Manitoba -	S. A. BEDFORD
" " Indian Head, N.W.T. -	ANGUS MACKAY
" " Agassiz, B.C. - -	THOS. A. SHARPE

FOR

1897

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST
EXCELLENT MAJESTY
1898

[No. 8a—1898.]

Office Building, Museum and Chemical Laboratory of the Central Experimental Farm.

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

OTTAWA, 1st December, 1897.

SIR,—I have the honour herewith to submit to you the eleventh annual report of work done and in progress at the Central Experimental Farm and also at the several Branch Experimental Farms.

Since the resignation of the late Agriculturist Mr. Jas. W. Robertson—in January, 1896—I have carried on the work of the Agriculturist in addition to the duties devolving on me as Director, and in this report as in that of 1896, full particulars of the results of all the experiments conducted with farm crops and stock, are presented in that part written by myself. You will also find appended reports from the following officers of the Central Experimental Farm: From the Horticulturist, Mr. John Craig; from the Chemist, Mr. Frank T. Shutt, and from the Entomologist and Botanist, Dr. James Fletcher. Reports are also submitted from the Poultry Manager, Mr. A. G. Gilbert, and from the Foreman of Forestry, Mr. W. T. Macoun.

From the Branch Experimental Farms there are reports from Mr. Geo. W. Forrest, Superintendent, and from Mr. W. S. Blair, Horticulturist of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, Superintendent of the Experimental Farm for Manitoba, at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for the North-west Territories, at Indian Head; and from Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

In these reports particulars are given of the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical work in the fields, barns, dairy and poultry buildings, orchards and plantations at the several experimental farms; also of scientific investigations in the chemical laboratory and the information gained from the careful study of the life histories and

habits of injurious insects and noxious weeds, and of the most practical and economical measures for their destruction. In the report of the Entomologist and Botanist there will also be found particulars of the experiments and observations made during the past year in connection with the Apiary.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the experimental farms is a gratifying evidence of the desire for information among this class of the community, also of the high esteem in which these records of the work of the farms are held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit grower and that they may assist in advancing these industries in this country.

I have the honour to be, sir,

Your obedient servant,

WM. SAUNDERS,
Director Experimental Farms.

To the Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS

REPORT OF THE DIRECTOR AND ACTING AGRICULTURIST.

(WM. SAUNDERS, LL.D., F.R.S.C., F.L.S.)

In the eleventh annual report of the Experimental Farms herewith submitted there will be found much information on agricultural topics, also on subjects bearing on agriculture; the results of a large number of experiments which have been conducted during the season of 1897 at each of the Experimental Farms with all the more important farm crops. These experiments have been planned to gain further information as to the most productive varieties to sow, also to find out which are the earliest to ripen. Additional information has also been sought as to the best time for sowing, the proper depth to sow, and the quantity of seed that should be used to produce the best results.

The advantages arising from the selection of plump, well matured seed of the best sorts, have been frequently urged and the good results arising from such a course demonstrated. New sorts are obtained by careful selection and cultivation, by the preservation and culture of occasional sports; also by cross-fertilizing. The farmer who tries to make the best of his opportunities may do much to improve both the character and quality of the grain he grows, and may with judicious care often raise crops of such quality as will command high prices for seed from his less thoughtful neighbours.

The judicious use of fertilizers to maintain the fertility of the land and to restore in the most economical manner those important elements of plant food which have been taken from the soil by frequent cropping, is a question of much importance; so also is that of the relative value of natural and artificial fertilizers for this purpose. Many interesting facts are given in this connection in that part of the report where the results obtained from the tests made with different fertilizers and combinations of fertilizers are noted on the special trial plots which have been devoted to that purpose for the past nine or ten years. Further information has been gained regarding the value of green crops for ploughing under to enrich the land, especially such leguminous crops as clover. The fact has been demonstrated that such crops can be put in with spring-sown grain without reducing the yield of such cereals, and that after the grain has been harvested the clover will grow vigorously during the summer, act as a catch crop all the season, by appropriating the elements of fertility which are brought down by the rain, and at the same time gather and lay up in its roots and leaves a large store of nitrogen for the use of subsequent crops. The tests, which have now been continued for several years, have shown such convincing results that during the last season nearly all the grain fields on the Central Experimental Farm have been sown with clover in this way. The quantities of fertilizing constituents which may thus be added to the soil at a small cost, are shown by the analyses which have been made and reported on by the Chemist of the Experimental Farms.

While it must be admitted that conditions of climate and the general character of the season—which are beyond the control of the farmer—are most important factors bearing on crop production, still there are many things which the farmer may do which will greatly increase the chances for abundant returns, provided the season is favourable. It is gratifying to know that during recent years more thought and attention has been given by farmers to their calling, that improvements have been manifest in the preparation of the soil, and the general management of the crops; the stores of fertility in the land have been more carefully husbanded, by a judicious rotation of crops; more attention has also been paid to the care of barn-yard manure, and greater efforts made to replace those elements in the soil, which repeated cropping has removed. The progress which has been made is encouraging; it has given Canadian farmers a reputation which it is most desirable should be maintained, and has, at the same time, aroused a spirit of inquiry in reference to agricultural affairs which promises well for the future. The enterprise and efforts towards improvement shown by our people have resulted in a greatly enlarged export trade to the mother country, particularly in animals and their products. Along these lines of farm work, co-operation and skill finds a large and remunerative field, and such exports can be carried on to an almost unlimited extent without depleting the soil in any material degree.

The scientific investigations which have been conducted at Ottawa have been of much value. Much work has been done in connection with injurious weeds in ascertaining the extent of their distribution and the best methods of checking the inroads of these vigorous invaders. Information has been given in response to many inquiries concerning injurious insects, and practical remedies for their subjugation suggested. Much interesting work has also been done in connection with bee-keeping. Useful work has also been accomplished in the chemical branch in determining the constituents of soils, and in giving suggestions as to the best methods by which they may be made more fertile. Further information has also been gained in reference to the results of the rotting of barn-yard manure under different conditions also in regard to the feeding value of forage crops, and on other kindred subjects.

Additional experience has been gained in connection with the feeding of poultry and their profitable management. Particulars of the results obtained will be found in the report of the Poultry Manager. Records of the rapid progress which has been made in connection with the Arboretum and Botanic Garden with particulars of the growth of the different species of timber trees comprising the forest belts are reported on by the Foreman of Forestry.

The experiments in cross-fertilizing have been successfully continued and a large number of new varieties produced, particularly of fruits which are likely to prove hardy on the North-west plains. The collection of fruits at Ottawa has also been enriched by the addition of many promising sorts.

The results of the practical tests which have been made in the feeding of steers, milch cows and swine at the Central Experimental Farm have been widely disseminated, and the information thus given has served a useful purpose in advancing these important branches of agricultural industry. The experiments conducted at the Branch Experimental Farms in Manitoba and the North-west Territories, along similar lines, have been most useful to those engaged in stock raising in that country, and the introduction of the Awnless Brome Grass and the demonstrations which have been made of its hardiness and value for hay and pasture have laid the foundation for a great extension of the trade in cattle and dairy products in the North-west country.

The many tests which have been made with a very large number of varieties of fruit at the Branch Experimental Farm at Agassiz, British Columbia, have been the means of bringing out much practical information in reference to fruit growing, and has materially aided that branch of industry, so important in the Pacific province.

The results of the tests undertaken in all these different lines of agricultural and horticultural work will be found in the subsequent pages. They have all been planned with the special object of furnishing reliable data for the use of those engaged in agricultural or horticultural pursuits in Canada.

EXPERIMENTS WITH OATS.

During the season of 1897, sixty-five varieties of oats have been tested under fairly uniform conditions, in order to gain information regarding their relative yield, earliness and other characteristics. They were all sown on the 5th and 6th of May on plots of $\frac{1}{20}$th acre each. The soil was a sandy loam of fair quality which received a light dressing of manure, about 12 tons per acre, in the autumn of 1895, when it was ploughed under. The land was ploughed in the autumn of 1896 about 8 inches deep, and disc-harrowed twice in the spring of 1897, and harrowed three times with the smoothing harrow before sowing. In the following table full particulars are given of the results obtained, and in the accompanying figure a view is given of a portion of these experimental plots at the time of harvest.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
					Inches.	Inches.		Bush.	lbs.	Lbs.	
1	Holland	Aug.	18	105	45 to 48	9 to 11	Sided	70	25	27¾	Considerably.
2	Golden Giant	"	17	103	42 to 48	10	"	57	12	26¼	Badly.
3	Mennonite	"	5	91	39 to 48	8 to 9	Branching	56	11	30¼	Considerably.
4	Improved American	"	7	93	42 to 50	8 to 9	"	53	28	30¼	"
5	Early Etampes	"	8	94	36 to 41	8 to 9	"	53	23	30¼	"
6	White Schonen	"	7	93	42 to 48	8 to 9	"	53	8	31½	"
7	Early Golden Prolific	"	6	93	42 to 48	8 to 9	"	50	30	33	"
8	White Russian	"	5	92	42 to 48	8 to 9	"	50	30	33½	Badly.
9	Columbus	"	6	92	42 to 48	9	"	49	29	30	Considerably.
10	Wallis	"	7	93	48 to 53	9 to 10	"	49	9	26½	Badly.
11	Joanette	"	7	93	36 to 42	8 to 9	"	49	4	31¾	Considerably.
12	American Triumph	"	6	92	40 to 48	9	"	49	3	32¼	"
13	Wide Awake	"	7	94	42 to 48	8 to 9	"	48	23	34¼	"
14	Banner	"	9	96	44 to 50	9 to 10	"	47	7	28½	Badly.
15	Golden Beauty	"	6	92	42 to 48	9	"	47	7	29	"
16	Lincoln	"	7	94	42 to 48	8 to 9	"	46	6	35	Considerably.
17	Bonanza	"	3	90	48 to 54	10 to 11	"	45	30	38¼	Badly.
18	Abundance	"	6	93	42 to 48	9 to 10	"	45	15	28¼	"
19	American Beauty	"	6	92	42 to 48	8 to 9	"	45	10	29¼	"
20	Thousand Dollar	"	6	93	43 to 48	8 to 9	"	45	10	36	Considerably.
21	Buckbee's Illinois	"	9	96	44 to 48	8 to 9	"	44	24	31¼	Badly.
22	Medal	"	8	94	48 to 55	10 to 12	Half-sided	44	14	32	"
23	Siberian O. A. C.	"	9	96	44 to 50	9 to 10	Branching	44	14	30	"
24	Miller	"	9	96	42 to 48	8 to 10	"	43	33	32¼	"
25	Scottish Chief	"	3	90	46 to 53	11 to 12	"	43	28	32½	"
26	Holstein Prolific	"	8	94	40 to 48	9 to 10	"	43	28	31¼	"
27	Victoria Prize	"	3	90	54 to 60	11 to 12	"	43	18	32	"
28	Improved Ligowo	"	5	91	45 to 52	8 to 9	"	42	17	33	"
29	Master	"	7	93	48 to 56	10 to 12	Half-sided	42	12	31½	"
30	Hazlett's Seizure	"	9	96	42 to 52	9 to 10	Branching	42	12	33¼	"
31	Welcome	"	3	90	48 to 54	9 to 11	"	41	16	34	"
32	White Wonder	"	3	90	48 to 54	10 to 11	"	40	25	33¼	"
33	Early Gothland	"	6	92	42 to 52	8 to 9	Half-sided	40	10	36½	Considerably.
34	Siberian	"	17	103	48 to 54	9 to 10	Sided	40	5	24½	"
35	Bavarian	"	9	96	44	8 to 9	Branching	39	9	28¾	Badly.
36	Russell	"	8	94	48 to 58	10 to 12	Half branching	39	4	32	"
37	Olive	"	8	94	40 to 50	9 to 10	Half-sided	38	23	30	"
38	Brandon	"	9	96	43 to 57	10 to 12	"	38	13	34	"
39	Prize Cluster	"	3	90	43 to 52	10 to 11	Branching	37	7	38	"
40	King	"	9	96	42 to 48	9 to 10	"	37	2	30¼	"
41	Pense	"	9	95	48 to 60	9 to 10	Half-sided	37	2	28¼	"
42	Early Maine	"	8	95	44 to 50	8 to 10	Branching	36	31	29	"
43	Rosedale	"	9	95	36 to 52	8 to 9	Half-sided	36	6	34	"
44	Oxford	"	9	96	48 to 56	10 to 12	"	36	6	33	"
45	Early Blossom	"	9	95	36 to 48	8 to 9	"	36	1	29	"
46	Abyssinia	"	9	95	36 to 48	8 to 9	"	35	3	33	"
47	Cromwell	"	9	96	46 to 56	10 to 12	"	35	25	34	"
48	Rennie's Prize White	"	5	92	48	10 to 11	Branching	34	24	34½	"

OATS—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.		No. of days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
					Inches.			Bush.	lbs.		
49	Imported Irish.........	Aug.	2	89	36 to 48	9 to 10	Branching..	34	4	39½	Badly.
50	Oderbruch	"	9	95	44 to 51	8 to 9	Half-sided..	33	4	34¼	"
51	Cream Egyptian.......	"	9	95	42 to 51	8 to 9	" ..	33	3	34¾	"
52	Winter Grey...........	"	3	90	48 to 58	11 to 12	Branching..	31	26	36½	"
53	Early Archangel.......	"	5	92	42 to 54	9 to 10	" ..	31	26	38	"
54	Golden Tartarian.....	"	17	103	44 to 50	10 to 11	Sided.......	31	8	24	"
55	California Prolific Black	"	13	99	38 to 48	8 to 10	"	30	20	26¾	"
56	Black Beauty..........	"	6	92	45 to 50	10 to 12	Branching..	30	7	33	"
57	Newmarket....	"	4	90	45 to 48	8 to 9	" ..	28	32	30¼	"
58	Flying Scotchman	"	6	93	42 to 45	9 to 11	" ..	28	23	36½	"
59	Coulommiers	"	18	104	42 to 45	9 to 10	" ..	28	13	29¼	"
60	White Monarch........	"	15	102	38 to 50	8 to 9	" ..	27	32	29½	"
61	Mortgage Lifter	"	2	89	36 to 48	10 to 11	" ..	27	17	35	"
62	Prolific Black Tartarian	"	13	99	42 to 48	8 to 10	Sided.......	23	11	22	"
63	Doncaster Prize........	"	15	102	39 to 45	8 to 9	Branching..	23	8	31	"
64	Poland	"	7	93	43 to 51	8 to 9	" ..	21	11	36	"
65	Scotch Hopetoun.......	"	15	102	44 to 48	8 to 10	" ..	18	3	26½	"

In the foregoing list are included eleven of the new cross-bred sorts which have been produced at the experimental farms. The names and parentage of ten of these were given in the Annual Report of the Experimental Farms for 1896, the 11th named Holland, was produced at the experimental farm at Brandon in 1892. It is a cross between Giant Cluster male and Prize Cluster female and was included in the test plots of varieties for the first time this year. It stands at the head of the list this season having exceeded in yield all the other sorts experimented with.

Owing to the almost continued wet weather which prevailed at Ottawa for a short time before and during harvest, all the varieties of oats were much injured by rust, their yield and weight was thus much reduced and some of the sorts which have for several years past given the largest crops have on this account fallen behind and hence occupy places lower down in the list.

TESTS FOR THE PREVENTION OF SMUT IN OATS.

Further experiments have been made during the past season in the treatment of seed grain to prevent this troublesome disease. In the Annual Report of the Experimental Farms for 1896, page 12, details are given of tests made with three varieties of oats which were soaked in a solution of potassium sulphide for 24 hours, and in every instance where the grain was so treated, although the seed used was very smutty the crop was practically free from smut. During the past season one variety only was used the Doncaster Prize oats and this was the worst affected with smut of any variety we had. The seed used in this test was from the untreated crop of last year of which about one-fourth of the heads were diseased. Different portions of the seed were soaked for varying periods in a solution of potassium sulphide made by dissolving 1½ pound in 25 gallons of cold water while others were treated with the Bordeaux Mixture made by dissolving 4 pounds of copper sulphate with 4 pounds of lime in 40 gallons imperial measure of water.

HOW TO MAKE BORDEAUX MIXTURE.

This may be conveniently made by taking an ordinary coal oil barrel which holds about 40 gallons imperial measure or 50 gallons wine measure. Fill this about two-thirds full of cold water and suspend the 4 pounds of copper sulphate (blue stone) in a

Uniform test plots of cereals at the Central Experimental Farm, Ottawa, 1897.

cotton bag so that it will be entirely immersed just under the surface of the water. In this way it dissolves rapidly. In another vessel slake 4 pounds of fresh lime with 4 gallons of water. After the lime is slaked the creamy mixture should be strained through a fine sieve or a piece of coarse sacking into the barrel containing the copper sulphate in solution when the barrel should be filled with water. After the mixture is thoroughly stirred it will be fit for use.

The oats were treated as follows with the results given. The size of the plots on which the oats were sown was about $\frac{1}{80}$th of an acre each and the heads were counted on 33 by 3 feet (99 square feet).

Material used.	Number of hours soaked.	Total Number of heads.	Number of good heads.	Number of smutty heads.
Bordeaux Mixture	4	2,502	2,500	2
Potassium Sulphide Solution	4	2,711	2,575	136
Bordeaux Mixture	8	3,013	3,011	2
Potassium Sulphide Solution	8	3,366	3,264	102
Bordeaux Mixture	12	3,058	3,055	3
Potassium Sulphide Solution	12	2,740	2,713	27
Bordeaux Mixture	24	2,817	2,815	2
Potassium Sulphide Solution	24	2,592	2,590	2
Untreated		2,730	1,720	1,010

From the above experiment it would appear that smutty oats soaked in Bordeaux Mixture for 4 hours are rendered as free from smut as if soaked for 8, 12 or 24 hours. But where potassium sulphide is used it appears to be necessary to steep the grain in the solution for 24 hours in order to entirely free it from smut. While the solution of potassium sulphide seems to be a reliable remedy for smut in oats provided the grain is steeped in it for 24 hours, the Bordeaux Mixture is a cheaper remedy, more easily obtainable, and appears to be quite as effective with only 4 hours soaking. It is proposed to test this remedy on a more extensive scale during the coming season.

FIELD CROPS OF OATS.

Golden Giant.—3½ acres. Soil a light sandy loam. The land was manured in 1895 with about 12 tons of barn-yard manure per acre. The previous crop was pease. It was ploughed in the autumn of 1896, about 8 inches deep, and in the following spring it was disc-harrowed once, and harrowed twice with the smoothing harrow before sowing. Sown 29th April, two bushels per acre, came up 9th and 10th May, and was ripe 17th August. The time to mature was 110 days. The yield per acre was 53 bushels 25 pounds, weight per bushel 31 pounds. Length of head, 9 to 11 inches, sided, length of straw, 48 to 51 inches. Made a strong and even growth, only a few spots lodged, there was some smut, and the leaves and stems were badly rusted.

Improved Ligowo.—4¼ acres. Soil a clay loam of good quality, which was manured in the autumn of 1894, with about 18 tons of barn-yard manure per acre. The previous crop was barley. The land was ploughed very shallow in 1896, immediately after harvest, to start shed grain and weed seeds, and again later in the autumn about 8 inches deep. In the spring of 1897, it was disc-harrowed twice, and harrowed twice with the smoothing harrow before sowing. Sown 30th April, two bushels per acre, came up 10th May; and was ripe 2nd August. The time to mature was 94 days, and the yield per acre was 44 bushels 10 pounds; weight per bushel, 37 pounds. Length of head, 8 to 10 inches, branching, length of straw, 44 to 48 inches. Made a strong and even growth; a few spots lodged. There was some smut, and the leaves and stems were considerably rusted.

Siberian, O.A.C.—$1\frac{3}{4}$ acre. The soil, preparation and treatment, was the same as that for the Improved Ligowo. The previous crop was barley. Sown 30th April, $1\frac{3}{4}$ bushel per acre, came up 10th May; and was ripe 5th August. The time to mature was 97 days. The yield per acre, 48 bushels 9 pounds; weight per bushel, 34 pounds. Length of head, 9 to 11 inches, branching, length of straw, 42 to 46 inches. Made a medium to strong growth, fairly even, and all stood well. There was a considerable quantity of smut, and the leaves and stems were badly rusted.

American Beauty.—$2\frac{1}{2}$ acres. The soil and treatment was the same as in the case of the Improved Ligowo. The previous crop was barley. Sown 30th April, two bushels per acre, came up 10th May, and was ripe 1st August. The time to mature was 93 days. Yield per acre, 50 bushels 12 pounds; weight per bushel, $35\frac{1}{2}$ pounds. Length of head, 7 to 9 inches, branching, length of straw, 42 to 47 inches. Made a medium but even growth; all standing well. There was some smut and the leaves and stems were badly rusted.

Mortgage Lifter.—$1\frac{1}{2}$ acre. The soil where this plot was located was scarcely so heavy or so good, but the treatment was the same, as that for the Improved Ligowo. Sown 30th April; two bushels per acre, came up 10th May; and was ripe 30th July. The time to mature was 91 days. Yield per acre, 39 bushels 15 pounds; weight per bushel, $41\frac{1}{2}$ pounds. Length of head, 7 to 9 inches; branching, length of straw, 38 to 44 inches; the straw was soft and weak. The growth was uneven, and lodged in spots. This variety was very badly affected with smut and the leaves and stems were very much rusted.

Joanette.—$1\frac{3}{4}$ acre. Soil a sandy loam of fair quality. The preparation and treatment was the same as that for the Improved Ligowo. The previous crop was barley. Sown 30th April; $1\frac{1}{2}$ bushel per acre, came up 10th May; and was ripe 9th August. The time to mature was 101 days. Yield per acre, 33 bushels 3 pounds, weight per bushel, 35 pounds. Length of head, 7 to 9 inches, branching; length of straw, 24 to 32 inches. Growth rather weak, but even, and all standing well. There was some smut and the leaves and stems were badly rusted.

Holstein Prolific.—$1\frac{1}{4}$ acre. Soil a sandy loam of fair quality, the preparation and treatment was the same as that for the Improved Ligowo. The previous crop was barley. Sown 30th April; $1\frac{3}{4}$ bushel per acre, came up 11th May; and was ripe 6th August. The time to mature was 98 days, Yield per acre, 46 bushels 2 pounds; weight per bushel, $33\frac{1}{2}$ pounds. Length of head, 9 to 11 inches, branching; length of straw, 36 to 44 inches. Made a medium and even growth; all standing well. There was some smut and the leaves and stems were badly rusted.

Wallis.—$2\frac{1}{2}$ acres. Soil a sandy loam of fair quality. The preparation and treatment was the same as that for the Improved Ligowo. The previous crop was partly mangels, and partly sunflowers. Sown 1st May; 2 bushels per acre, came up 11th May, and was ripe 6th August. The time to mature was 97 days. Yield per acre, 46 bushels 32 pounds; weight per bushel, 33 pounds. Length of head, 9 to 11 inches, branching, length of straw, 40 to 48 inches. Growth medium to strong and fairly even, only a few spots lodged. There was some smut, and the leaves and stems were badly rusted.

Early Gothland.—2 acres. Soil partly clay loam, partly sandy loam, and part peaty. This land was manured in the spring of 1896, with about 12 tons of barn-yard manure per acre. The previous crop was corn. It was ploughed late in the autumn of 1896, from 7 to 8 inches deep, and in the following spring, it was disc-harrowed twice, and harrowed twice with the smoothing harrow before sowing. Sown 4th May; $1\frac{3}{4}$ bushel per acre; came up 14th May; and was ripe 3rd August. The time to mature was 91 days. Yield per acre, 40 bushels 20 pounds; weight per bushel, $34\frac{1}{4}$ pounds. Length of head, 8 to 9 inches; half sided; length of straw, 38 to 44 inches. Made a medium growth; all standing well. There was some smut, and the leaves and stems were slightly rusted.

Golden Beauty.—2 acres. This was sown adjoining the Early Gothland, and the preparation and treatment of the land was the same. Sown 4th May; $1\frac{3}{4}$ bushel per acre;

came up 14th May; and was ripe 4th August. The time to mature was 92 days. Yield per acre, 41 bushels 11 pounds; weight per bushel, 35 pounds. Length of head, 9 to 11 inches; branching; length of straw, 38 to 46 inches. Made a strong and even growth, but there were a few spots lodged. There was some smut, and the leaves and stems were badly rusted.

Columbus.—1 acre. This also was adjoining the Early Gothland, and the character of the land and the treatment were the same; sown 4th May; $1\frac{3}{4}$ bushel per acre; came up 14th May; and was ripe 7th August. The time to mature was 95 days. Yield per acre, 36 bushels 8 pounds; weight per bushel, 30 pounds; length of head, 9 to 11 inches, branching; length of straw, 40 to 47 inches. Made a strong and even growth, but some spots were lodged. There was some smut, and the leaves and stems were badly rusted.

Flying Scotchman.—1 acre. This was sown near the Early Gothland; the soil was similar, and the preparation and treatment of the land the same. Sown 4th May; $1\frac{3}{4}$ bushel per acre; came up 14th May; and was ripe 30th July. The time to mature was 87 days. Yield per acre, 35 bushels 22 pounds; weight per bushel, 38 pounds. Length of head, 7 to 10 inches, branching; length of straw, 38 to 42 inches. Made a medium and even growth; all standing well. There was some smut, and the leaves and stems were badly rusted.

White Schonen.—1 acre. The soil and its treatment and preparation were the same as for Early Gothland. Sown 4th May; $1\frac{3}{4}$ bushel per acre; came up 14th May; and was ripe 7th August. The time to mature was 95 days. Yield per acre, 38 bushels 23 pounds; weight per bushel, $33\frac{1}{4}$ pounds. Length of head, 8 to 9 inches, branching; length of straw, 38 to 44 inches. Made a medium but even growth; all standing well. There was some smut, and the leaves and stems were badly rusted.

Early Golden Prolific.—1 acre. The soil was part sandy loam and part peaty. The land was manured in the spring of 1896 with about 12 tons of barn-yard manure per acre. It was ploughed late in the autumn of 1896 from 7 to 8 inches deep, and in the following spring it was disc-harrowed twice and harrowed twice with the smoothing harrow before sowing. The previous crop was Indian corn. Sown 4th May; $1\frac{3}{4}$ bushel per acre; came up 14th May; and was ripe 7th August. The time to mature was 95 days. Yield per acre, 37 bushels 6 pounds; weight per bushel, 31 pounds. Length of head, 7 to 9 inches, branching; length of straw, 33 to 41 inches. Growth medium and even; all standing well. There was some smut, and the leaves and stems were considerably rusted.

Early Archangel.—1 acre. The soil was similar and the preparation and treatment the same as for the Early Golden Prolific. Sown 4th May; $1\frac{3}{4}$ bushel per acre; came up 14th May; and was ripe 2nd August. The time to mature was 90 days. Yield per acre, 34 bushels 23 pounds; weight per bushel, $33\frac{1}{4}$ pounds. Length of head, 7 to 9 inches, branching; length of straw, 38 to 44 inches. Medium to strong growth; all standing well excepting in one spot, which was lodged. There was some smut, and the leaves and stems were badly rusted.

Hazlett's Seizure.—1 acre. The soil was sandy loam of a poor quality; its preparation and treatment the same as for the Early Golden Prolific. Sown 4th May; $1\frac{3}{4}$ bushel per acre; came up 14th May; and was ripe 6th August. The time to mature was 94 days. Yield per acre, 26 bushels 26 pounds; weight per bushel, 30 pounds. Length of head, 9 to 11 inches, branching; length of straw, 38 to 46 inches. Growth medium; all standing well. There was some smut, and the leaves and stems were very badly rusted.

Mennonite.—1 acre. The soil was sandy loam of a poor quality; its preparation and treatment the same as for the Early Golden Prolific. Sown 4th May; $1\frac{3}{4}$ bushel per acre; came up 14th May; and was ripe 3rd August. The time to mature was 91

days. Yield per acre, 30 bushels 18 pounds; weight per bushel, 29 pounds. Length of head, 7 to 10 inches, branching; length of straw, 36 to 41 inches. Growth medium; all standing well. There was some smut, and the leaves and stems were badly rusted.

Wallis.—1½ acre The soil was sandy loam of poor quality; its preparation and treatment the same as for the Early Golden Prolific. Sown 4th May; 2 bushels per acre; came up 15th May; and was ripe 7th August. The time to mature was 95 days. Yield per acre, 26 bushels 26 pounds; weight per bushel, 33 pounds. Length of head, 8 to 10 inches, branching; length of straw, 41 to 46 inches. Growth medium and even; some spots lodged. There was some smut, and the leaves and stems were badly rusted.

Bavarian.—6½ acres. Soil sandy loam of variable character; part of it of fair quality, and part of poor quality. This land was manured in the autumn of 1896 with about 12 tons of barn-yard manure per acre, and then ploughed under about 8 inches deep. The previous crop was Indian corn. In the spring of 1897, the land was disc-harrowed twice, and harrowed with the smoothing harrow twice before sowing. Sown 6th May; 2 bushels per acre; came up 15th May; and was ripe 12th August. The time to mature was 98 days. Yield per acre, 35 bushels 17 pounds; weight per bushel, 32 pounds. Length of head, 8 to 10 inches, branching; length of straw, 38 to 44 inches. Growth medium and even; all standing well. There was some smut, and the leaves and stems were considerably rusted.

Banner.—5½ acres. Soil sandy loam of poor quality, a part of it peaty. The preparation and treatment was the same as that for the Bavarian. Sown 6th May; 2 bushels per acre; came up 15th May, and was ripe 12th August. The time to mature was 98 days. Yield per acre, 29 bushels 12 pounds; weight per bushel, 31 pounds. Length of head, 8 to 10 inches, branching; length of straw, 38 to 44 inches. Growth medium, rather weak in the lower spots; all standing well. There were a few heads of smut, and the leaves and stems were considerably rusted.

Abundance—4½ acres. The soil was a sandy loam of fair quality, which was manured in the spring of 1896 with about 10 tons of barn-yard manure per acre. The previous crop was barley. This was not ploughed in the autumn, but was ploughed about 6 inches deep in the spring of 1897, and harrowed three times with the smoothing harrow before sowing. Sown 8th May; 2 bushels per acre; came up 16th May; and was ripe 10th August. The time to mature was 94 days. Yield per acre, 49 bushels 14 pounds; weight per bushel, 34¼ pounds. Length of head, 8 to 11 inches; branching, length of straw, 44 to 49 inches. Growth strong and even, but badly lodged. There was some smut, and the leaves and stems were badly rusted.

EXPERIMENTS WITH BARLEY.

Experiments have been conducted during 1897 with 52 varieties of barley, 23 of which were 2-rowed sorts, and 29 were 6-rowed. These were all sown in plots of $\frac{1}{20}$th acre each. The soil was a sandy loam of good quality, which received a dressing of barn-yard manure during the winter of 1895-96, the manure being placed on the land during the winter in small piles of about half a cart load each and spread in the spring. The previous crop was part flax and part oats. The land was ploughed in the autumn of 1896 from 7 to 8 inches deep, disc-harrowed once in the spring of 1897 and harrowed 3 times with the smoothing harrow before sowing. The 2-rowed varieties were sown from the 1st to 3rd of May, and the 6-rowed on 30th April and 1st May.

TWO-ROWED BARLEY—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.	Inches.	Bush.	Lbs	Lbs	
1 Newton	Aug.	2	91	30 to 39	2½ to 3	41	7	45½	Slightly.
2 Logan	"	2	93	40 to 51	3 to 3¾	38	31	47	"
3 Canadian Thorpe	"	1	92	33 to 43	2½ to 3	38	26	46¾	"
4 Kirby	July	30	90	36 to 48	2¾ to 3½	38	21	45¼	"
5 Dunham	"	30	90	45 to 53	3¼ to 4	37	18	47	Considerably.
6 Sidney	Aug.	1	92	40 to 48	3 to 3½	35	41	46	Slightly.
7 Leslie	"	1	93	40 to 48	3 to 3½	35	30	48	"
8 Danish Chevalier	"	2	91	30 to 38	3½ to 4½	34	38	45¼	Considerably.
9 Victor	"	1	92	34 to 46	3¼ to 4	34	28	48	Slightly.
10 Beaver	"	1	90	46 to 50	3½ to 4	34	8	48¼	"
11 Warren	"	1	92	42 to 48	3 to 3¾	33	6	47	Considerably.
12 Pacer	"	1	92	41 to 48	2½ to 3	32	41	49	Slightly.
13 Nepean	"	1	92	43 to 48	2½ to 3¼	31	27	48	"
14 Bolton	"	1	92	42 to 45	3 to 4	31	23	48½	"
15 Jarvis	July	30	90	48 to 53	3½ to 4½	31	9	48¼	"
16 Harvey	"	30	90	36 to 52	3 to 3¾	29	28	47	"
17 Gordon	Aug.	1	92	43 to 48	2½ to 3	29	18	47	"
18 French Chevalier	"	2	93	31 to 39	3¾ to 4¾	24	28	44	"
19 Prize Prolific	"	3	94	33 to 40	3½ to 4½	22	24	44	"
20 Thanet	"	1	90	36 to 44	4 to 4½	21	17	47	Badly,
21 Kinver Chevalier	"	2	91	36 to 44	3¾ to 4¾	19	28	42	Considerably.
22 Monck	"	7	98	36 to 46	3½ to 4	18	26	47	
23 Rigid	"	8	97	36 to 42	2¾ to 3	14	8	46¼	"

Included in the foregoing list are 14 new hybrid sorts of two-rowed barley which have been produced at the experimental farms. The names and parentage of 13 of these were given in the Annual Report of the Experimental Farms for 1896, the 14th named Warren was originated from Baxter's six-rowed fertilized with the pollen of a two-rowed variety, the Duck-bill, in 1892 by Mr. W. T. Macoun at Ottawa.

FIELD CROPS OF TWO-ROWED BARLEY.

Canadian Thorpe.—1¾ acre. Soil a sandy loam of fair quality, which received a dressing of about 12 tons of barn-yard manure, per acre, in the spring of 1895. No fertilizer has been applied since. The previous crop was oats. The land was ploughed late in the autum of 1896 about 8 inches deep and disc-harrowed twice the following spring and harrowed twice with the smoothing harrow before sowing. Sown 7th May; 2 bushels per acre; came up 15th May; and was ripe 2nd August. The time to mature was 87 days. Yield per acre, 35 bushels 27 pounds; weight per bushel, 49¾ pounds. Length of head, 3 to 3¼ inches; length of straw, 36 to 44 inches; growth uneven, medium to weak; all standing well. There was some smut, and the leaves and stems were badly rusted.

SIX-ROWED BARLEY—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.	Inches.	Bush.	Lbs.	Lbs	
1 Odessa	July	27	87	41 to 48	2¾ to 3¼	54	3	44	Considerably.
2 Pioneer	"	26	86	48 to 55	2 to 3	50	40	48	Slightly.
3 Mansfield	"	27	88	42 to 50	2 to 3	49	24	45	"
4 Mensury	"	30	90	42 to 52	3 to 4	49	18	44¼	"
5 Trooper	"	26	86	42 to 44	2¼ to 2¾	48	41	47¼	"
6 Royal	"	25	85	36 to 46	2½ to 3	48	6	45¼	"
7 Oderbruch	"	26	86	46 to 51	2 to 3	48	6	47	"
8 Argyle	"	27	87	42 to 48	2 to 3	47	34	44½	"
9 Empire	"	27	87	46 to 50	2½ to 3¼	47	9	47	Considerably.
10 Rennie's Improved	"	25	85	36 to 48	2 to 2½	46	26	46	"
11 Stella	"	24	84	42 to 48	2 to 2½	45	25	47	Slightly.
12 Success	"	22	82	42 to 48	2 to 2½	44	15	44¼	"
13 Vanguard	"	24	84	44 to 51	2¼ to 3	44	13	45	"
14 Petschora	"	24	84	36 to 48	2¼ to 3	43	36	43½	"
15 Nugent	"	30	90	42 to 48	2¼ to 3	43	6	45⅓	"
16 Albert	"	30	91	36 to 48	3 to 3¼	43	1	44¼	"
17 Blue Barley	"	24	84	36 to 42	2½ to 3	42	34	42	Considerably.
18 Summit	"	26	86	41 to 48	2 to 3	41	37	48¼	Slightly.
19 Phœnix	"	25	85	44 to 50	2 to 2½	41	11	46	"
20 Excelsior	"	25	85	45 to 53	2½ to 3	40	40	43	"
21 Champion	"	26	86	52 to 56	3 to 3¾	40	10	41	Considerably.
22 Common	"	25	85	33 to 42	2 to 3	40		46¼	Slightly.
23 Surprise	"	27	87	39 to 45	2 to 2¾	38	12	47	"
24 Claude	"	26	87	36 to 48	2¼ to 3¼	37	4	43	"
25 Monde (hulless)	"	24	84	39 to 48	2½ to 3	36	2	57½	"
26 Baxters	"	27	87	38 to 48	2 to 2½	35	7	46	Considerably.
27 Brome	"	30	90	36 to 43	2½ to 3¼	33	1	47	Slightly.
28 Yale	"	30	90	40 to 52	2 to 3	32	26	44¼	"
29 Garfield	"	27	87	36 to 48	2 to 3	30	45	45¼	"

Included in this list of varieties of six-rowed barley there are seventeen new hybrid sorts which have been produced at the experimental farms. The names and parentage of 15 of these were given in the annual report for 1896, the two now added are 16 Vanguard and 17 Surprise. These were originated in 1889, at the Central Experimental Farm at Ottawa, by the Director and are both hybrids between Swedish (two-rowed) female with Baxter's (six-rowed) male.

FIELD CROPS OF SIX-ROWED BARLEY.

Royal.—2½ acres. Soil a sandy loam, rather light in character, which received a coating of barn-yard manure of about 12 tons per acre in the spring of 1895. No fertilizer has been applied since. The previous crop was oats. The land was ploughed very lightly after harvest to start weed seeds and shed grain, and again later in the autumn, about 8 inches deep. In the spring it was disc-harrowed twice, and harrowed twice with the smoothing harrow before sowing. Sown 1st May ; 1¾ bushel per acre ; came up 10th May ; and was ripe 26th July. The time to mature was 86 days. Yield per acre, 29 bushels 42 pounds ; weight per bushel, 48 pounds. Length of head, about 3 inches ; length of straw, 42 to 46 inches. Growth medium to strong and even ; all standing well, and the grain ripened very evenly. There was some smut but no rust.

Trooper.—2⅓ acres. This was adjoining the field of Royal barley ; the soil was similar and the preparation and treatment of the land the same. Sown 1st May ; 1¾ bushel per acre ; came up 10th May ; and was ripe 27th July. The time to mature was 87 days. Yield per acre, 26 bushels 15 pounds ; weight per bushel, 49¼ pounds. Length

of head, $2\frac{1}{2}$ to 3 inches; length of straw, 40 to 42 inches; growth medium to weak; all standing well. There was some smut but no rust.

Mensury.—$2\frac{3}{4}$ acres. This and the three following plots were adjoining that of Trooper; the soil was similar and the preparation and treatment of the land the same throughout. Sown 3rd May; $1\frac{3}{4}$ bushel per acre; came up 10th May; and was ripe 25th July. The time to mature was 83 days. Yield per acre, 36 bushels 47 pounds; weight per bushel, $48\frac{1}{4}$ pounds. Length of head, 3 to $3\frac{1}{4}$ inches; length of straw, 44 to 48 inches. Growth strong and even; all standing well. There was some smut but no rust.

Champion.—$\frac{1}{2}$ acre. Sown 3rd May; $1\frac{3}{4}$ bushel per acre; came up 11th May, and was ripe 25th July. The time to mature was 83 days. Yield per acre, 43 bushels 46 pounds; weight per bushel, 44 pounds. Length of head, 3 to $3\frac{1}{4}$ inches; beardless; length of straw, 42 to 44 inches. Growth medium to strong; standing fairly well. There was some smut, and the leaves and stems were somewhat rusted.

Success.—$\frac{1}{2}$ acre. Sown 3rd May; $1\frac{3}{4}$ bushel per acre; came up 11th May, and was ripe 22nd July. The time to mature was 81 days. Yield per acre, 43 bushels 29 pounds; weight per bushel, $45\frac{1}{4}$ pounds. Length of head, 2 to $2\frac{1}{4}$ inches; beardless; length of straw, 36 to 40 inches. Growth medium and even; all standing well. No smut or rust.

Odessa.—$\frac{3}{4}$ acre. Sown 3rd May; $1\frac{3}{4}$ bushel per acre; came up 11th May, and was ripe 26th July. The time to mature was 84 days. Yield per acre, 37 bushels 10 pounds; weight per bushel, 48 pounds. Length of head $2\frac{3}{4}$ to 3 inches; length of straw, 32 to 41 inches. Growth strong and even; standing fairly well, only one spot lodged. There was some smut, and the leaves and stems were slightly rusted.

EXPERIMENTS WITH SPRING WHEAT.

Fifty-six varieties of spring wheat were tested during the season of 1897, grown on plots of $\frac{1}{20}$th acre each. The land selected for the wheat plots was adjoining that used for the test of varieties of barley, the soil was similar and the preparation and treatment of the land the same. The previous crop was barley. The plots were all sown on the 29th and 30th April at the rate of one and a half bushel per acre.

SPRING WHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.	Inches.		Bush.	Lbs.	Lbs.	
1 Plumper	Aug.	3	95	46 to 50	$2\frac{1}{2}$ to $3\frac{1}{4}$	Bearded	26	42	59	Considerably.
2 Roumanian	"	9	102	48 to 52	$2\frac{1}{4}$ to $2\frac{3}{4}$	"	26	30	$57\frac{1}{4}$	Slightly.
3 Wellman's Fife	"	9	102	52 to 56	4 to $4\frac{1}{2}$	Beardless.	24	55	53	"
4 Blair	"	2	94	42 to 48	$2\frac{1}{2}$ to 3	"	24	10	58	"
5 Mason	"	2	94	42 to 47	$2\frac{1}{2}$ to $3\frac{1}{2}$	"	23	20	$59\frac{1}{4}$	Considerably.
6 White Fife	"	8	100	39 to 48	3 to $3\frac{1}{2}$	"	23	5	$54\frac{1}{4}$	Slightly.
7 Harold	July	27	89	43 to 52	2 to 3	Bearded	22	50	56	Considerably.
8 Colorado	Aug.	4	94	44 to 51	$2\frac{3}{4}$ to $3\frac{1}{2}$	"	22	15	$58\frac{1}{2}$	"
9 Monarch	"	9	102	48 to 52	4 to 5	Beardless.	22	7	54	Slightly.
10 Rio Grande	"	8	101	36 to 54	4 to 5	Bearded	22		58	Considerably.
11 Laurel	"	9	101	42 to 54	$3\frac{1}{2}$ to 4	Beardless.	22		51	Slightly.
12 White Connell	"	10	102	44 to 51	$3\frac{1}{4}$ to 4	"	21	30	$52\frac{1}{4}$	"
13 Old Red River	"	9	102	42 to 48	$3\frac{1}{2}$ to 4	"	21	27	52	"
14 Crawford	"	2	94	42 to 50	$2\frac{1}{2}$ to $3\frac{1}{2}$	"	21	20	$55\frac{1}{4}$	Considerably.
15 Huron	"	3	96	42 to 50	3 to $3\frac{1}{2}$	Bearded	21		55	Slightly.
16 Advance	"	3	96	42 to 51	3 to $3\frac{1}{2}$	"	20	40	55	"
17 White Russian	"	9	101	42 to 55	$3\frac{1}{2}$ to $4\frac{1}{2}$	Beardless.	20	35	52	"

SPRING WHEAT—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
			Inches.	Inches.		Bush.	Lbs.	lbs.	
18 Cartier	Aug. 2	94	36 to 46	2½ to 3	Bearded	20	25	59¼	Considerably.
19 Hungarian	" 5	98	48	3 to 3½	"	20	20	54¼	"
20 Blenheim	" 5	98	42 to 48	3 to 4	"	20	17	55	"
21 Preston	" 5	98	42 to 48	3 to 4	"	20	10	55	Slightly.
22 Pride of Baropa	" 5	97	42 to 48	2¾ to 3½	Beardless	20	10	56¼	"
23 Dufferin	" 2	95	43 to 52	2¼ to 3	Bearded	19	55	57	Considerably.
24 Countess	" 3	95	42 to 46	2½ to 3½	Beardless	19	55	58½	Slightly.
25 Dawn	" 2	95	42 to 46	2¾ to 3½	"	19	55	56	Considerably.
26 Rideau	" 2	95	42 to 52	2¼ to 3	"	19	55	53	"
27 Crown	" 3	96	42 to 48	3 to 3½	Bearded	19	45	55	"
28 Bishop	" 2	95	42 to 50	2½ to 3½	Beardless	19	30	58	"
29 Goose	" 6	99	42 to 48	2 to 2½	Bearded	19	15	58½	Slightly.
30 Red Fife	" 9	102	40 to 48	3¼ to 4	Beardless	19	15	52	"
31 Pringle's Champlain	" 4	97	40 to 48	3½ to 4½	Bearded	19		56	"
32 Progress	" 6	99	48 to 51	3 to 4	Beardless	18	55	54½	"
33 Essex	" 8	100	42 to 48	3½ to 4	"	18	55	52	Considerably.
34 Ebert	" 3	95	39 to 48	2½ to 3	"	18	45	56½	Badly.
35 Stanley	" 5	98	48	3 to 4	"	18	10	53½	Slightly.
36 Angus	" 2	94	40 to 48	2½ to 3	"	17	50	58	"
37 Admiral	" 8	100	48 to 52	....	"	17	30	52	"
38 Dawson	" 6	98	42 to 48	3½ to 4	"	17	25	54	Considerably.
39 Alpha	" 6	99	48 to 52	3 to 4	"	17	10	53	Slightly.
40 Vernon	" 8	101	42 to 48	2¾ to 3½	Bearded	16	50	53	Considerably.
41 Captor, Red Chaff	" 5	98	44 to 51	3 to 4	Beardless	16	50	52	Slightly.
42 Percy	" 5	98	42 to 51	3 to 3½	"	16	39	54	"
43 Fraser	" 1	93	36 to 44	2½ to 3	Bearded	16	10	59½	Considerably.
44 Campbell's White Chaff	" 7	100	48 to 51	3 to 3½	Beardless	16		51	Badly.
45 Black Sea	" 3	96	42 to 48	3 to 3½	Bearded	15	55	52	Considerably.
46 Jordan	" 6	98	46 to 50	3 to 4	Beardless	15	37	51	"
47 Golden Drop	" 4	96	43 to 48	2½ to 3	"	15		51	"
48 Ladoga	" 3	96	48 to 53	3 to 3½	Bearded	14	55	53	"
49 Beauty	" 8	101	48 to 52	3½ to 4½	Beardless	14	35	50	"
50 Captor	" 3	96	36 to 48	2½ to 3½	"	14	13	52	"
51 Beaudry	" 3	96	48 to 53	3 to 3½	Bearded	14		54½	Slightly.
52 Herisson Bearded	" 5	98	45 to 51	1½ to 2	"	13	50	52½	"
53 Percy, White Chaff	" 5	98	42 to 51	3 to 4	Beardless	13	37	50	"
54 Red Fern	" 8	101	36 to 48	3½ to 4½	Bearded	12	59	52½	Considerably.
55 Dions	" 8	101	48 to 52	3½ to 4½	"	12	50	52	"
56 Emporium	" 8	101	50 to 54	3½ to 4½	"	10	21	51½	"

In the foregoing list there are included thirty-one of the new cross-bred sorts which have been originated at the experimental farms. A list of the names and parentage of fifteen of these was given in the annual report for 1896, a continuation of this list will be found below :—

16. Angus—Early Sonora	Female with	Red Fife	Male.
17. Dawson—White Connell	do	Hard Red Calcutta	do
18. Fraser—Alpha	do	Hard Red Calcutta	do
19. Crawford—Alpha	do	Gehun	do
20. Jordan—Red Fife	do	Anglo Canadian	do
21. Laurel—Red Fife	do	Gehun	do
22. Plumper—Colorado	do	Gehun	do
23. Blair—Colorado	do	Gehun	do
24. Mason—Colorado	do	Gehun	do
25. Cartier—Colorado	do	Gehun	do
26. Bishop—Ladoga	do	Gehun	do
27. Ebert—Gehun	do	Ladoga	do
28. Harold—Gehun	do	Onega	do

29.	Essex—White Fife	Female with	Stewart	Male.
30.	Countess—Early Sonora	do	Red Fife	do
31.	Rideau—Spiti Valley	do	Red Fife	do

Of these results in cross-fertilizing six were originated at the Central Experimental Farm by the Director, three in 1889, Nos. 16, 30 and 31, two in 1890, Nos. 20 and 29, and one in 1891, No. 23. Seven were the results of the work of Mr. W. T. Macoun also at the Central Farm; six were produced in 1891, Nos. 22, 24, 25, 26, 27 and 28, and one in 1892, No. 19. Three were originated by Dr. A. P. Saunders, in 1892, two of them Nos. 17 and 21 at the branch experimental farm at Brandon, Manitoba and one No. 18 at the branch farm at Agassiz, British Columbia.

FIELD PLOTS OF WHEAT.

Preston.—½ acre. Soil a sandy loam of fair quality, which received a dressing of barn-yard manure in the spring of 1896, of about 12 tons per acre. The previous crop was potatoes. The land was ploughed in the autumn of 1896, about 8 inches deep, and in the following spring disc-harrowed twice and harrowed twice with the smoothing harrow before sowing. Sown 1st May; 1½ bushel per acre; came up 11th May; and was ripe 7th August. The time to mature was 98 days. Yield per acre, 28 bushels 42 pounds; weight per bushel, 56½ pounds. Length of head, 3 to 3¼ inches; length of straw, 36 to 40 inches. Growth medium to strong and even; all standing well. There was no smut, but the leaves and stems were badly rusted.

Advance.—½ acre. This and the next plot referred to were both adjoining the Preston; the soil was similar and the preparation and treatment of the land the same Sown 1st May; 1½ bushel per acre; came up 11th May; and was ripe 7th August. The time to mature was 98 days. Yield per acre, 25 bushels 1 pound; weight per bushel, 55 pounds. Length of head, 3¾ to 4 inches; length of straw, 36 to 41 inches. Growth tolerably even; standing fairly well; some of the straw was broken about a foot from the ground. There was no smut, but the leaves and stems were badly rusted.

Herisson Bearded.—½ acre. Sown 1st May; 1½ bushel per acre; came up 11th May; and was ripe 9th August. The time to mature was 100 days. Yield per acre, 25 bushels 58 pounds; weight per bushel, 57½ pounds. Length of head, 2 to 2¼ inches; length of straw, 36 to 40 inches. Growth medium to strong and even; all standing well. There was no smut, but the leaves and stems were badly rusted.

EXPERIMENTS WITH PEASE.

During the season of 1897, seventy-nine varieties of pease have been tested on uniform plots of $\frac{1}{20}$th acre each, and the results are given in the appended table. The land on which these pease were sown was adjoining that used for the plots of barley, the soil however was a lighter sandy loam and not so good in quality. The preparation and treatment of the land was the same as that used for the barley plots. The land was occupied in 1896 with experimental plots of wheat, oats and barley. The plots of pease were all sown on the 3rd and 4th of May with the following results:—

PEASE—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Yield per Acre.		Weight per Bushel.
				Inches.	Inches.	Bush.	Lbs.	Lbs.
1 Canadian Beauty	Aug. 24	112	Strong	60 to 96	2½ to 3¼	31	50	63
2 Oddfellow	″ 6	95	″	36 to 48	1½ to 2	30	30	66
3 Arthur	″ 7	95	″	....	....	30	20	63
4 Creeper	″ 21	109	″	48 to 72	1¾ to 3½	29	40	63¼
5 King	″ 20	109	″	60 to 84	2 to 2½	29	35	62
6 Cooper	″ 14	103	″	36 to 60	1¾ to 2½	29		62
7 Picton	″ 12	101	″	60 to 84	2½ to 3	28	9	63
8 Macoun	″ 31	119	″	72 to 96	2¼ to 3	27	40	61
9 Fergus	″ 20	109	″	72 to 84	2 to 2½	27	40	61½
10 Prussian Blue	″ 12	100	″	72 to 96	2¼ to 2¾	27	20	63¼
11 Gregory	″ 17	106	″	48 to 60	2 to 2¾	27	20	61
12 Lanark	″ 9	98	″	48 to 72	2½ to 3	27	15	60¼
13 Fenton	″ 12	100	″	60 to 72	2½ to 3¼	27	10	60¼
14 Prince Albert	″ 28	117	″	84 to 96	2 to 2½	27	5	63½
15 Pearl	″ 30	119	″	72	2½ to 3	27		62
16 Crown	″ 14	103	″	60 to 72	2 to 2½	26	50	63¼
17 Harrison's Glory	″ 9	98	Medium	30 to 36	2¼ to 3	26	40	60¼
18 Forbes	″ 14	103	Strong	72 to 84	1½ to 2½	26	40	62
19 Early Britain	″ 7	95	″	48	2¼ to 2¾	26	30	59
20 Dixon	″ 19	108	″	72 to 84	2½ to 3	26	20	62¼
21 Perth	″ 9	97	″	48 to 60	2¼ to 3	26	20	61
22 Victoria	″ 30	118	″	72 to 96	2¼ to 2¾	26	..	61¼
23 Lisgar	″ 18	107	″	60 to 84	2¼ to 3	25	50	62½
24 Vincent	″ 10	98	″	42 to 48	2½ to 3	25	50	61½
25 Weston	″ 28	117	″	72 to 84	2¼ to 3	25	40	62½
26 Carleton	″ 19	107	″	60 to 72	2 to 2½	25	40	63
27 New Potter	″ 27	115	″	72 to 96	2½ to 3	25	20	62
28 Dover	″ 24	113	″	60 to 72	2¼ to 3	25		62½
29 Alma	″ 20	109	″	60 to 84	2 to 2¾	25		63
30 Agnes	″ 9	98	″	48 to 60	2½ to 3	24	45	61½
31 Prospect	″ 17	106	″	60 to 72	2¼ to 2¾	24	40	60
32 Derby	″ 28	117	″	60 to 72	2¼ to 3	24	40	61
33 Elephant Blue	″ 9	97	″	36 to 48	2 to 2¾	24	40	62
34 Kent	″ 26	114	″	48 to 72	2½ to 3¼	24	30	62
35 Duke	″ 23	111	″	48 to 72	2¼ to 3	24	30	63
36 Black Eyed Marrowfat	″ 19	108	″	60 to 84	2½ to 3	24	20	62¼
37 Elliott	″ 12	101	″	48 to 72	2½ to 3	24	5	61
38 Dexter	″ 14	103	″	48 to 60	2¼ to 3	24	3	61¼
39 Chelsea	″ 18	107	″	60 to 72	1¾ to 2½	23	50	63
40 Mummy	″ 7	95	Medium	36 to 48	2 to 2½	23	50	64¼
41 Kerry	″ 27	116	Strong	84 to 96	2½ to 3¼	23	50	61¼
42 Nelson	″ 7	95	″	36 to 42	2 to 2¾	23	45	64¼
43 Elder	″ 27	116	″	48 to 72	1¾ to 2½	23	45	62¼
44 German White	″ 6	94	″	42 to 48	2½ to 3	23	40	61
45 Clarke	″ 18	107	″	48 to 72	1¾ to 2½	23	30	64
46 Ogden	″ 29	118	″	84 to 96	2 to 2½	23	20	62½
47 Herald	″ 17	106	″	60	2 to 2½	23	10	64
48 Hazen	″ 12	101	″	72 to 84	2½ to 3	23	10	63
49 Dover	″ 24	113	″	60 to 72	2¼ to 3	23	10	63
50 Grant	″ 16	105	″	60 to 84	2¼ to 3	23	10	61½
51 Paragon	″ 29	117	″	72 to 84	2½ to 3¼	22	50	61¼
52 Bedford	″ 30	118	″	84 to 108	2 to 2½	22	50	62½
53 Tracey	″ 17	105	″	60 to 72	2¼ to 3	22	50	62
54 Jackson	″ 15	104	″	72	1¾ to 2½	22	45	63
55 Leader	″ 18	106	″	72 to 84	2½ to 3¼	22	30	60
56 Chancellor	″ 5	93	″	48 to 72	1 to 2	22		61¾
57 Comet	″ 23	112	″	72 to 84	2 to 3	22		60½
58 Surrey	″ 28	116	″	72 to 84	2¼ to 3	21	50	62¼
59 Bruce	″ 20	108	″	60	2½ to 3¼	21	30	60¼
60 Multiplier	″ 18	106	″	60	2 to 2½	21		63¼
61 Golden Vine	″ 18	106	Medium	30 to 54	1½ to 2¼	20	50	63
62 Nixon	″ 18	107	Strong	60 to 72	2 to 3	20	40	62¼
63 Large White Marrowfat	″ 12	100	″	48 to 60	2½ to 3	20	30	
64 Bright	″ 29	117	″	60 to 84	2¼ to 3	20	20	63
65 Centennial	″ 21	109	″	60	2 to 2¾	20	20	62¼

PEASE—TEST OF VARIETIES—*Continued.*

Name of Variety.	Date of Ripening.	No. of days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Yield per Acre.		Weight per Bushel.
				Inches.	Inches.	Bush.	Lbs.	Lbs.
66 Moore	Aug. 7	96	Strong	48	$2\frac{1}{2}$ to 3	20		$59\frac{1}{2}$
67 Archer	" 18	106	"	60 to 72	2 to $2\frac{1}{2}$	20		$63\frac{1}{4}$
68 Vasey	" 26	114	"	60 to 72	$2\frac{1}{2}$ to $3\frac{1}{4}$	19	50	$61\frac{1}{4}$
69 Albion	" 20	108	"	60 to 72	2 to $2\frac{1}{2}$	19	40	63
70 Mackay	" 14	102	"	36 to 60	$2\frac{1}{4}$ to 3	17	40	62
71 Elva	" 23	111	"	72	$2\frac{1}{4}$ to 3	17	5	63
72 Trilby	" 30	118	"	60 to 72	$2\frac{1}{2}$ to $3\frac{1}{4}$	15	40	61
73 Prince	" 18	106	"	60 to 72	$2\frac{1}{2}$ to 3	15		62
74 Kingsford	" 9	98	"	36 to 48	2 to $2\frac{1}{2}$	14	55	$63\frac{1}{2}$
75 Luther	" 23	111	"	60 to 84	$2\frac{1}{2}$ to 3	14	30	$61\frac{1}{2}$
76 Excelsior	" 24	112	"	60 to 72	2 to $2\frac{1}{2}$	14	20	62
77 Daniel O'Rourke	" 5	93	Medium	36 to 42	2 to $2\frac{3}{4}$	14		$61\frac{1}{2}$
78 White Wonder	" 5	93	"	18 to 30	$2\frac{1}{4}$ to $2\frac{3}{4}$	9	5	62
79 Pride	" 6	94	"	24 to 30	2 to $2\frac{1}{2}$	7	40	60

The Pease, White Wonder and Pride, are both low growers and happened to be sown on a rather low spot, on which weeds grew unusually rank, and hence the vines were partly smothered, and the yields very small. Hitherto both these varieties have given good crops. Mackay also which was near the head of the list last year has not given a satisfactory return. The vines were very thin on the plot, due either to faulty germination of the seed, or to the ravages of cut worms.

The following new varieties included in the above list have been tested for the first time, Oddfellow, Harrison's Glory, Elephant Blue and German White.

FIELD CROPS OF PEASE.

Creeper.—$\frac{1}{2}$ acre. Soil sandy loam of medium quality, which received a dressing of barnyard manure of about 12 tons per acre in the spring of 1895. No fertilizer has been applied since. The previous crop was hay. The land was ploughed in the spring of 1897 about 6 inches deep, disc-harrowed once and harrowed twice with the smoothing harrow before sowing. Sown 13th May; 2 bushels per acre; came up 22nd May, and was ripe 23rd August. The time to mature was 102 days. Yield per acre, 38 bushels 9 pounds; weight per bushel, $63\frac{1}{2}$ pounds. Growth medium and even; pods small, fairly abundant. Length of straw, 46 to 52 inches.

Agnes.—$\frac{1}{2}$ acre. This plot and that of Arthur, which follows, were sown adjoining Creeper; the soil was similar and the preparation and treatment of the land the same. Sown 13th May; $2\frac{1}{2}$ bushels per acre; came up 22nd May and was ripe 25th August. The time to mature was 104 days. Yield per acre, 33 bushels 24 pounds; weight per bushel, 62 pounds. Growth medium and even; pods large. Length of straw, 41 to 52 inches.

Arthur.—$\frac{1}{2}$ acre. Sown 13th May; 2 bushels per acre; came up 22nd May, and was ripe 19th August. The time to mature was 98 days. Yield per acre, 38 bushels 14 pounds; weight per bushel, 64 pounds. Well podded; pods small and in clusters, like the Mummy; the straw also resembles the Mummy in thickness and in its upright growth. Length of straw, 39 to 48 inches.

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

These experiments have all been conducted on similar land on $\frac{1}{10}$th acre plots, the plots adjoining each other.

OATS SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Ripening	No. of Days Maturing.	Length of Straw.	Weight of Straw per acre.	Yield of grain per acre.		Weight per bushel.	Rusted.
				Inches.	Lbs.	Bush.	lbs.		
Banner	April 13	Aug. 2	111	44 to 48	3,220	70	..	34¾	Slightly.
"	" 21	" 3	104	44 to 51	2,350	77	22	34¼	Considerably.
"	" 28	" 9	103	46 to 51	2,330	69	24	34¾	Badly.
"	May 5	" 11	98	38 to 48	2,350	66	6	29	"
"	" 12	" 14	94	36 to 48	2,790	54	24	29¼	"
"	" 19	" 14	87	38 to 42	3,050	42	22	24	"
Abundance	April 13	" 1	110	44 to 46	3,100	44	14	37	Slightly.
"	" 21	" 2	103	48 to 51	3,720	58	8	34	Considerably.
"	" 28	" 7	101	46 to 49	3,850	53	8	34¾	Badly.
"	May 5	" 9	96	34 to 44	3,350	50	10	33	"
"	" 12	" 12	92	46 to 49	3,890	40	10	35	"
"	" 19	" 14	87	36 to 41	3,190	37	12	24	"

BARLEY SOWN AT DIFFERENT DATES.

Canadian Thorpe	April 13	July 26	104	42 to 46	3,200	35	40	49	No rust.
"	" 21	" 26	96	46 to 49	3,610	46	42	44	"
"	" 28	" 30	93	32 to 38	2,830	35	10	48¼	Considerably.
"	May 5	Aug. 2	89	46 to 47	2,630	36	2	48¼	"
"	" 12	" 6	86	44 to 47	2,245	19	32	44	Badly.
"	" 19	" 11	84	....	1,880	21	12	42	"
Odessa	April 13	July 23	101	40 to 46	3,720	40	20	47	No rust.
"	" 21	" 23	93	40 to 42	3,230	53	36	47	"
"	" 28	" 26	89	40 to 42	2,830	41	22	47	"
"	May 5	" 27	83	42 to 48	2,910	36	42	47	"
"	" 12	Aug. 2	82	28 to 36	2,340	31	32	47	Considerably.
"	" 19	" 5	78	26 to 31	2,270	27	34	42¼	Badly.

SPRING WHEAT SOWN AT DIFFERENT DATES.

Red Fife	April 13	Aug. 4	113	38 to 43	1,900	19	20	51½	Considerably.
"	" 21	" 7	108	38 to 44	4,120	20	40	55½	"
"	" 28	" 9	103	38 to 45	3,640	18	50	50½	Badly.
"	May 5	" 12	99	35 to 39	3,370	16	50	54½	"
"	" 12	" 14	94	35 to 39	2,430	10	50	52¼	Very badly.
"	" 19	" 16	89	24 to 36	1,680	7		54¼	"
Stanley	April 13	" 2	111	36 to 38	1,200	16	50	51¾	Badly.
"	" 21	" 6	107	38 to 44	3,770	20	30	54¼	Considerably.
"	" 28	" 7	101	36 to 44	3,260	17	20	52½	Badly.
"	May 5	" 9	96	34 to 38	2,660	12	40	51	Very badly.
"	" 12	" 12	92	36 to 42	2,230	7	30	51	Badly.
"	" 19	" 14	87	24 to 36	2,480	6	20	54¼	Very badly.

PEASE SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Ripening	No. of Days Maturing.	Length of Straw.	Weight of Straw per acre.	Yield of grain per acre.		Weight per bushel.
				Inches.	Lbs.	Bush.	lbs.	
Mummy	April 13	Aug. 2	111	48 to 52	2,220	23	40	63¼
"	" 21	" 4	105	48 to 54	1,680	28	20	63
"	" 28	" 6	100	48 to 54	1,340	27	.	64
"	May 5	" 7	94	48 to 54	1,530	24	40	65
"	" 12	" 8	88	42 to 48	1,335	23	25	64¼
"	" 19	" 14	87	40 to 48	930	22	50	61
Golden Vine	April 13	" 4	113	55 to 60	2,330	25	50	63
"	" 21	" 7	108	50 to 58	1,680	29	40	63½
"	" 28	" 9	103	50 to 54	1,360	24	50	63
"	May 5	" 13	100	50 to 56	1,270	28	20	63¾
"	" 12	" 14	94	50 to 55	1,230	23	20	64
"	" 19	" 18	91	50 to 55	1,570	19	10	63½

SUMMARY OF RESULTS OF EARLY, MEDIUM, AND LATE SOWINGS FOR THE WHOLE PERIOD.

The following are the average crops which have been obtained, during the full period these tests have been continued—that is eight years with the oats, barley and spring wheat, and three years with the pease :—

Tests continued for Eight Years.									Tests continued for Three Years.		
Oats.	Average Yield per acre.		Barley.	Average Yield per acre.		Spring Wheat.	Average Yield per acre.		Pease.	Average Yield per acre.	
	Bush.	lbs.		Bush.	lbs.		Bush.	lbs.		Bush.	lbs.
1st Sowing	54	31	1st Sowing	39	43	1st Sowing	18	23	1st Sowing	29	21
2nd "	59	8	2nd "	41	30	2nd "	19	23	2nd "	32	45
3rd "	50	2	3rd "	32	29	3rd "	14	19	3rd "	33	25
4th "	44	14	4th "	29	10	4th "	12	28	4th "	29	14
5th "	39	17	5th "	25	3	5th "	10	34	5th "	26	19
6th "	29	23	6th "	22	33	6th "	8	56	6th "	24	6

EXPERIMENTS WITH INDIAN CORN.

During the season of 1897, twenty-eight varieties of Indian corn have been tested side by side on fairly uniform land. The soil was a sandy loam of fair quality which received in the spring of 1894, an application of about 12 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was pease. The land was ploughed in the autumn of 1896, about 8 inches deep and again in the spring of 1897, about 6 inches deep and harrowed twice with the smoothing harrow before planting. The varieties were all planted 25th May, and were cut for ensilage 17th September. The yield per acre has been calculated from the weight of the crop cut from two rows each 66 feet long.

INDIAN CORN—TEST OF VARIETIES.

Name of Variety.	Character of Growth.	Description of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Early Milk.	Condition when cut.	Weight per acre grown in rows. Tons.	Lbs.
			Inches.							
1 Selected Leaming	Very strong.	Red and yellow dent.	132 to 144	Leafy	Aug. 6	Aug. 11		Early milk.	36	1,260
2 Giant Prolific Ensilage	"	White dent.	132 to 144	"	" 7	" 12		"	36	1,062
3 Cloud's Early Yellow	"	Red and yellow dent.	120 to 132	"	" 4	" 12		"	32	416
4 Mammoth Cuban	"	"	120 to 144	"	" 6	" 16		"	31	1,228
5 Red Cob Ensilage	"	White dent.	126 to 144	"	" 15	" 23		"	30	1,512
6 Cuban Giant	"	Red and yellow dent.	120 to 144	"	" 3	" 11		"	26	800
7 Thoroughbred White Flint	"	White flint	120 to 132	Very leafy	" 9	" 18		Nearly in early milk.	26	767
8 Champion White Pearl	"	White dent	132 to 144	Leafy	" 8	" 17		"	25	556
9 North Dakota White	Strong	White flint	96 to 102	"	July 31	" 8		Glazed	25	292
10 Mammoth Eight-rowed Flint	"	Yellow flint	96 to 108	"	" 27	" 4	Aug. 27	Late milk	24	708
11 Ninety Day	Very strong.	White dent	114 to 126	"	Aug. 4	" 9		Early milk	23	992
12 Wisconsin White Dent	"	"	120 to 132	"	" 3	" 9		Late milk	23	576
13 Longfellow	Strong	Yellow flint	96 to 114	Very leafy	July 30	" 8	Sept. 1	"	22	1,870
14 Pride of the North	Very strong.	Red and yellow dent.	120 to 132	Leafy	" 30	" 5	Aug. 31	"	22	1,804
15 North Dakota Yellow	Strong	Yellow flint	90 to 102	"	" 29	" 4	" 27	Glazed	22	165
16 Early Butler	"	Red and yellow dent.	96 to 108	"	" 31	" 5		Late milk.	21	1,296
17 Sanford	"	White flint	96 to 108	"	" 27	" 4	Aug. 27	"	21	1,164
18 Extra Early Huron Dent	"	Red and yellow dent.	108 to 120	"	" 31	" 4	" 29	"	20	1,976
19 Compton's Early	"	Yellow flint.	96 to 120	"	Aug. 2	" 11		"	20	1,976
20 Angel of Midnight	"	"	96 to 108	Very leafy	July 27	" 4	Aug. 27	Glazed	20	1,580
21 White Cap Yellow Dent	Very strong.	Yellow and white dent.	120 to 144	"				Late milk	19	1,290
22 Canada White Flint	Strong	White flint	96 to 108	Leafy	July 26	Aug. 1	Aug. 24	Glazed	18	1,818
23 Wisconsin Yellow Dent	"	Red and yellow dent.	102 to 114	"	" 30	" 5		Late milk	18	102
24 King of the Earliest	"	"	96 to 108	Fairly leafy	" 29	" 5	Aug. 31	"	17	980
25 Pearce's Prolific	"	Yellow flint.	84 to 108	Leafy	" 27	" 6	" 27	Glazed	17	848
26 Mitchell's Extra Early	Medium	White flint	60 to 72	Fairly leafy.	" 24	July 26	" 15	Ripe	16	736
27 Mammoth Sweet Fodder	"	Sweet	78 to 96	"	" 24	" 26	" 17	Nearly ripe	13	1,720
28 Kendall's Giant	"	"	66 to 84	"	" 25	" 30	" 25	Late milk	13	400

FIELD CROPS OF INDIAN CORN.

The following varieties were sown in larger field plots :—

Mammoth Eight-rowed Flint.—2 acres. Soil, sandy loam of fair quality, with patches of heavier soil which were partly clay. The land was ploughed in the autumn of 1896 about 8 inches deep and received an application of barn-yard manure of about 15 tons per acre, distributed in small piles of about one-third of a cart-load each, during the winter, and spread in the spring, after which it was ploughed under about 6 inches deep and harrowed twice with the smoothing harrow before sowing. The previous crop consisted partly of pease and partly of buckwheat. Planted 27th May, in hills 3 feet apart each way, 4 to 5 kernels in each hill; came up 10th June; and was cut for ensilage 22nd September. The growth was strong and even, leafy from top to bottom, and 7 to 8 feet high; the ears were well advanced in the glazed condition, some beginning to harden. Yield per acre, 19 tons 38 pounds.

Compton's Early.—2½ acres. This and the three following field plots were adjoining the Mammoth Eight-rowed Flint; the soil was similar, excepting that on which the Angel of Midnight was planted, and the preparation and treatment of the land in each case the same. Planted 27th May, in hills; came up 10th June; and was cut for ensilage on 21st September. Growth, strong and even; leafy from top to bottom; 7 to 8 feet high; stalks extra well eared; and the ears well advanced in the glazed condition, some beginning to harden. Yield, 15 tons 1,190 pounds per acre.

Angel of Midnight.—2 acres. Part of the land in this field was low and clayey, and hence less suitable for this crop. Planted 26th May, in hills; came up 10th June; and was cut for ensilage 22nd September. Growth, strong and even; leafy from top to bottom; height, 7 to 8 feet; stalks extra well eared, and the ears well advanced in the glazed condition. Yield per acre, 12 tons 1,877 pounds.

White Cap Yellow Dent.—2 acres. Planted 26th May, in hills; came up 10th June; and was cut for ensilage 24th September. Growth, strong and even; leafy, especially towards the top; height, 10 to 12 feet; stalks well eared, and the ears in the late milk. Yield per acre, 17 tons 1,797 pounds.

Extra Early Huron.—½ acre. Soil sandy loam of good quality; treatment and preparation the same as that for Mammoth Eight-rowed Flint. Planted 26th May, in hills; came up 9th June; and was cut for ensilage 24th September. Growth strong and even; leafy at top and fairly leafy below; height, 9 to 10 feet; stalks well eared, and ears in the late milk. Yield per acre, 18 tons 730 pounds.

Canada White Flint.—½ acre. This and the thirteen following one-half acre plots, were all in the same field as Extra Early Huron; the soil was similar, and the preparation and treatment of the land the same as for that variety. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 24th September. Growth strong and even; leafy from top to bottom; height, 7½ to 8½ feet; stalks well eared, ears beginning to ripen. Yield per acre, 16 tons 1,460 pounds.

Sanford Flint.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 24th September. Growth very strong and even; leafy throughout; height 7½ to 8 feet; stalks well eared, ears in late milk. Yield per acre, 18 tons 930 pounds.

Rural Thoroughbred White Flint.—½ acre. Planted 22nd May, in hills; came up 11th June; and was cut for ensilage 27th September. Growth very strong and even; leafy from top to bottom; height 9 to 10 feet; stalks well eared, ears in the early milk stage. Yield per acre, 23 tons 1,934 pounds

Pride of the North.—½ acre. Planted 22nd May, in hills; came up 9thJune; and was cut for ensilage 24th September. Growth, strong and even; leafy from top to bottom; height, 9 to 10 feet; stalks well eared, grain beginning to harden. Yield per acre, 16 tons 320 pounds.

Red Cob Ensilage.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 27th September. Growth strong and even; fairly leafy at top, with few leaves at bottom; height, 12 to 14 feet; ears not plentiful, in early milk. This variety is too late in ripening here to make ensilage of best quality. Yield per acre, 24 tons 134 pounds.

Selected Leaming.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 27th September. Growth strong and even; leafy at top, few leaves at bottom; stalks well eared, ears in late milk. Yield per acre, 23 tons 910 pounds.

Early Butler.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 24th September. Growth strong and even; leafy at top, fewer leaves at bottom; stalks well eared, ears beginning to harden. Yield per acre, 17 tons 1,970 pounds.

North Dakota White.—½ acre. Planted 22nd May, in hills; came up 10th June; and was cut for ensilage 27th September. Growth strong and even; leafy throughout; height, 8 to 10 feet; stalks well eared, ears in the glazing stage, beginning to harden. Yield per acre, 19 tons 1,600 pounds.

Ninety-day Corn.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 28th September. Growth strong and even; leafy throughout; height, 10 to 12 feet; stalks well eared, ears in late milk. Yield per acre, 17 tons 590 pounds.

Cloud's Early Yellow Dent.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 28th September. Growth strong and even; leafy above, with very few leaves below; height 10 to 12 feet; stalks well eared, ears in late milk. Yield per acre, 23 tons 1,520 pounds.

Mammoth Cuban.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 28th September. Growth strong and even; leafy above, very few leaves below; stalks well eared, ears in late milk. Yield per acre, 21 tons 434 pounds.

Mammoth Giant Fodder.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 28th September. Growth medium and even; very leafy throughout; stalks well eared, ears in early milk. This variety is rather too late in ripening to be useful in this district. Yield per acre, 14 tons 1,236 pounds.

Giant Prolific Ensilage.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 28th September. Growth very strong and even; leafy above, with few leaves below; height, 12 to 14 feet; stalks well eared, ears in early milk. This variety is too late in ripening here to make ensilage of the best quality. Yield per acre, 18 tons 870 pounds.

Champion White Pearl.—1¾ acre. The soil was a light sandy loam, which was manured in the spring of 1893 with about 18 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was oats. The land was ploughed in the spring of 1897, disc-harrowed once, and harrowed with the smoothing harrow twice before planting. Planted 18th May, in hills 3 feet apart each way, 4 or 5 kernels to the hill; came up 4th June; and was cut for ensilage 30th September. Growth strong and even; leafy above, with few leaves below; height, 12 to 13 feet; stalks well eared, ears in the glazed condition. Yield per acre, 16 tons 938 pounds.

King of the Earliest.—2 acres. Soil a sandy loam of poor quality, which received an application of barn-yard manure in the spring of 1897, of about 10 tons per acre. After the manure was spread the land was ploughed about 6 inches deep, disc-harrowed once, and harrowed with the smoothing harrow twice before planting; planted 27th May, in rows 3 feet apart; came up 11th June; and was cut for ensilage 17th September. Growth medium to weak; leafy from top to bottom; height, 8 to 9 feet; stalks well eared, ears in the late milk. Yield per acre, 11 tons 105 pounds. In this and the

following plot (Longfellow) the soil was not as good nor as suitable for the crop, and for this reason the yield was less than it would have been under more favourable conditions.

Longfellow.—2 acres. This was planted adjoining the King of the Earliest, on similar soil, which had the same preparation and treatment. Planted 27th May, in rows 3 feet apart; came up 11th June; and was cut for ensilage 17th September. Growth medium to weak; leafy throughout; height, 7 to 8 feet; stalks well eared, ears in glazing stage. Yield per acre, 13 tons 945 pounds.

EXPERIMENTS WITH TURNIPS.

Nineteen varieties of turnips were tested during the past season in plots, side by side, all having the same treatment. The soil was a heavy sandy loam of good quality, more or less mixed with clay. The previous crop was hay. The land was manured in the spring of 1893, with about 18 tons of barn-yard manure per acre; no fertilizer has been applied since. It was ploughed very shallow after the hay crop was taken off, and again later in the autumn about 8 inches deep. In the spring of 1897, it was ploughed again about 8 inches deep and harrowed twice with the smoothing harrow. The land was then made up in drills two feet apart and subsequently rolled with a heavy land roller which flattened the drills nearly one-half leaving a firm seed bed. Three sowings of turnips were made at the rate of about 3 pounds of seed per acre. The first sowing was on the 8th of May, the second on 21st May, and the third on 13th of June. The roots from the first two sets were pulled on the 13th and 14th October, and those from the third set on the 14th October. The yield per acre in each case has been calculated from the weight of roots pulled from two rows each 99 feet long.

TURNIPS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 3rd Plot.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1 Shamrock Purple Top	44	1,100	27	1,770	29	245
2 Purple Top Swede	44	770	26	965	18	465
3 Great Mogul	43	130	33	1,650	....	......
4 Perfection Swede	42	1,965	25	1,315	21	75
5 Giant King	41	5	30	885	20	590
6 Marquis of Lorne	40	1,510	26	1,845	25	1,920
7 Jumbo or Monarch	40	905	28	925	29	115
8 Prize Winner	40	850	26	855	21	1,835
9 Mammoth Clyde	39	1,915	28	815	27	1,110
10 Carter's Elephant	38	1,220	34	1,300	31	260
11 East Lothian	38	230	30	445	26	470
12 Prize Purple Top	36	1,975	24	510	14	1,040
13 Hall's Westbury	36	1,590	26	910	27	1,880
14 Hartley's Bronze	36	765	27	780	32	717
15 Skirving's	36	600	28	1,915	21	240
16 Sutton's Champion	35	1,280	22	55	23	282
17 Halewood's Bronze Top	35	345	24	235	17	1,337
18 Bangholm Selected	34	1,300	27	890	23	1,300
19 Selected Champion	32	1,395	27	1,110	22	385

These turnips were all sown in rows varying from 200 to 400 feet in length, which gave opportunity for further experiments, after the two rows of 99 feet each, used to ascertain the yield in the first place, had been pulled. A portion of the roots in this

area, were left in the ground until the 3rd of November, to gain information as to the advantage, if any, which arises from the leaving of the roots in the ground, after the middle of October. Nineteen plots were so left until the 3rd of November, which allowed 20 and 21 days for additional growth for the roots, from the first and second sowings, and 20 days for those of the third sowing.

Results of leaving Turnips in the ground as long as practicable after the usual time of pulling :

YIELD OF ROOTS PER ACRE FROM EARLY AND LATE PULLING.

	Name of Variety.	1st pulling, 13th October, from 1st sowing, 8th May.		2nd pulling, 3rd Novem'r, from 1st sowing, 8th May.		1st pulling, 13th October, from 2nd sowing, 21st May.		2nd pulling, 3rd Novem'r, from 2nd sowing, 21st May.		1st pulling, 13th October, from 3rd sowing, 13th June.		2nd pulling, 3rd Novem'r, from 3rd sowing, 13th June.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Shamrock Purple Top	44	1,100	45	1,080	27	1,770	31	370	29	245	32	707
2	Purple Top Swede	44	770	47	1,040	26	965	30	1,215	18	465	22	522
3	Great Mogul	43	130	42	480	33	1,650	44	1,870	29	520	31	1,177
4	Perfection Swede	42	1,965	41	1,160	25	1,315	32	1,395	21	75	30	555
5	Giant King	41	5	39	1,420	30	885	29	1,675	20	590	29	300
6	Marquis of Lorne	40	1,510	42	315	26	1,845	28	1,750	25	1,920	30	280
7	Jumbo or Monarch	40	905	40	520	28	925	27	1,615	29	115	31	370
8	Prize Winner	40	850	39	375	26	855	28	155	21	1,835	27	1,137
9	Mammoth Clyde	39	1,915	40	1,180	28	815	28	1,365	27	1,110	32	350
10	Carter's Elephant	38	1,220	42	150	34	1,300	32	735	31	260	35	1,940
11	East Lothian	38	230	40	1,840	30	445	28	430	26	470	31	480
12	Prize Purple Top	36	1,975	38	560	24	510	24	675	14	1,040	17	650
13	Hall's Westbury	36	1,590	40	850	26	910	34	1,300	27	1,880	29	557
14	Hartley's Bronze	36	765	41	830	27	780	29	1,015	32	717	32	277
15	Skirvings	36	600	37	148	28	1,915	27	1,220	21	240	30	1,710
16	Sutton's Champion	35	1,280	35	1,885	22	55	26	470	23	282	30	307
17	Halewood's Bronze Top	35	345	37	1.900	24	235	30	1,710	17	1,337	32	1,862
18	Bangholm Selected	34	1,300	38	1,990	27	890	28	100	23	1,300	28	320
19	Selected Champion	32	1,395	35	1,610	27	1,110	27	395	22	385	26	1,487

	Tons.	Pounds.
Average yield per acre from 1st sowing 1st pulling..	38	1,782
" " 1st sowing 2nd pulling..	40	807

An average gain in 20 to 21 days of 1 ton 1,025 pounds per acre.

	Tons.	Pounds.
Average yield per acre from 2nd sowing 1st pulling..	27	1,537
" " 2nd sowing 2nd pulling.	30	182

An average gain in 20 to 21 days of 2 tons 646 pounds per acre.

	Tons	Pounds.
Average yield per acre 3rd sowing 1st pulling	24	673
" " " 3rd sowing 2nd pulling	30	182

An average gain in 20 days of 5 tons 432 pounds per acre.

The results of these experiments show that growth in turnips late in the season proceeds rapidly as long as the weather remains open, and point to the importance of allowing these roots to remain in the ground as long as is practicable, especially if the seed has been sown late ; on the other hand a farmer who leaves a large area of roots in the ground to a very late date is liable to be caught by severe frost when the pulling of such a crop is disagreeable, difficult and expensive.

EXPERIMENTS WITH MANGELS.

The number of varieties of mangels under test during 1897 was twenty. These were all sown side by side adjoining the turnips, the land was similar and the treatment and preparation the same. The drills were made up two feet apart and rolled with a heavy land roller to make a firm bed before the seed was sown. Two sowings were made, the first on the 8th May, the second on the 21st May, and the roots from both were pulled on the 13th October.

MANGELS—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.		2nd Plot Sown.		1st Plot Pulled.		2nd Plot Pulled.		Yield per acre, 1st plot.		Yield per acre, 1st plot.		Yield per acre, 2nd plot		Yield per acre, 2nd plot	
									Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1 Giant Yellow Intermediate (Steele)	May	8	May	21	Oct.	11	Oct.	11	46	1060	1551		37	305	1238	25
2 Gate Post	"	8	"	21	"	11	"	11	44	1815	1496	55	35	1335	1188	55
3 Canadian Giant	"	8	"	21	"	11	"	11	40	1345	1355	45	28	1420	957	
4 Golden Tankard	"	8	"	21	"	11	"	11	35	950	1182	30	22	605	743	25
5 Mammoth Long Red	"	8	"	21	"	11	"	11	34	1960	1166		28	485	941	25
6 Champion Yellow Globe	"	8	"	21	"	11	"	11	34	1630	1160	30	22	605	743	25
7 Selected Mammoth Long Red.	"	8	"	21	"	11	"	11	34	845	1080	45	23	1850	797	30
8 Yellow Intermediate	"	8	"	21	"	11	"	11	33	715	1111	55	21	1560	726	
9 Red Fleshed Tankard	"	8	"	21	"	11	"	11	32	1010	1083	30	28	815	946	55
10 Red Fleshed Globe	"	8	"	21	"	11	"	11	32	405	1073	25	23	365	772	45
11 Giant Yellow Globe	"	8	"	21	"	11	"	11	31	1855	1064	15	26	1790	896	30
12 Prize Mam. Long Red	"	8	"	21	"	11	"	11	31	1690	1061	30	25	655	844	15
13 Golden Fleshed Tankard	"	8	"	21	"	11	"	11	30	1050	1017	30	21	240	704	
14 Warden Orange Globe	"	8	"	21	"	11	"	11	29	1730	995	30	27	835	913	55
15 Selected Mammoth Long Red Extra	"	8	"	21	"	11	"	11	29	850	980	50	18	1950	632	30
16 Giant Yellow Half Long	"	8	"	21	"	11	"	11	29	740	979		19	1765	662	45
17 Ward's Large Oval-shaped	"	8	"	21	"	11	"	11	28	155	935	55	19	280	638	
18 Giant Yellow Intermediate (Pearce)	"	8	"	21	"	11	"	11	25	1535	858	55	16	395	539	55
19 Giant Yellow Globe Special	"	8	"	21	"	11	"	11	24	840	814		17	980	583	
20 Norbitan Giant	"	8	"	21	"	11	"	11	19	1325	655	25	10	130	335	30

FIELD PLOTS OF MANGELS.

The following four half-acre plots were all sown in the same field with the smaller plots reported on. The soil was similar and its preparation and treatment the same.

Giant Yellow Intermediate.—½ acre. Sown 7th May; came up 16th May; and the roots were pulled 12th October. Yield per acre, 18 tons 1,100 pounds.

Mammoth Long Red.—½ acre. Sown 7th May; came up 17th May; and the roots were pulled 12th October. Yield per acre, 17 tons 600 pounds.

Gate Post.—½ acre. Sown 7th May; came up 17th May; and the roots were pulled 12th October. Yield per acre, 21 tons 80 pounds.

Champion Yellow Globe.—½ acre. Sown 8th May; came up 17th May; and the roots were pulled, 13th October. Yield per acre, 23 tons 550 pounds.

EXPERIMENTS WITH CARROTS.

Sixteen varieties of carrots were sown side by side on land adjoining that used for the turnips, the soil was similar and the treatment of the land the same. The seed was sown on ridges 2 feet apart, at the rate of 3 to 4 pounds per acre. Two sowings were

made of each sort—the first on 8th May; the second on 21st May; and the roots from both were pulled on the 11th October. After the drills were made, they were rolled with a heavy hand roller at the time of the first sowing, and before the second set of plots was sown, the surface of the drills was worked with a hand wheel hoe to destroy any weeds which had germinated. The yield per acre has been calculated from the weight of roots gathered from two rows each 99 feet long.

CARROTS—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per acre, 1st plot.		Yield per acre, 1st plot.		Yield per acre, 2nd plot		Yield per acre, 2nd plot	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1 Mammoth White Intermediate	May 8	May 21	Oct. 11	Oct. 11	24	180	803		19	445	640	45
2 Green Top White Orthe	" 8	" 21	" 11	" 11	23	1850	795	30	20	95	668	15
3 Giant White Vosges	" 8	" 21	" 11	" 11	23	200	770		19	940	649	
4 Iverson's Champion	" 8	" 21	" 11	" 11	21	1230	720	30	16	1000	550	
5 Improved Short White	" 8	" 21	" 11	" 11	21	570	709	30	21	240	704	
6 Half Long White.............	" 8	" 21	" 11	" 11	20	1305	688	25	17	980	583	
7 Half Long Chantenay	" 8	" 21	" 11	" 11	19	1270	654	30	14	1810	496	50
8 Guerande or Oxheart.........	" 8	" 21	" 11	" 11	19	5	633	25	12	475	407	55
9 Early Gem	" 8	" 21	" 11	" 11	18	1345	622	25	14	1755	495	55
10 White Belgian	" 8	" 21	" 11	" 11	18	740	612	20	15	1680	528	
11 Yellow Intermediate	" 8	" 21	" 11	" 11	17	45	567	25	15	195	503	15
12 Cooper's Yellow Intermediate.	" 8	" 21	" 11	" 11	14	490	474	50	11	1430	390	30
13 Carter's Orange Giant	" 8	" 21	" 11	" 11	13	400	440		10	1505	358	25
14 Long Orange or Surrey	" 8	" 21	" 11	" 11	11	1595	393	15	10	625	343	45
15 Scarlet Intermediate..........	" 8	" 21	" 11	" 11	9	1140	319		7	1510	258	30
16 Long Scarlet Altringham	" 8	" 21	" 11	" 11	8	1490	291	30	8	1380	289	40

As in the case of the turnips a part of the carrot crop was allowed to remain in the ground until the 3rd November to ascertain what advantage would accrue to the weight of the crop by adopting such a course.

YIELD OF ROOTS PER ACRE FROM EARLY AND LATE PULLING.

Name of Variety.	1st Pulling 11th October from 1st Sowing 8th May.		2nd Pulling 3rd Nov. from 1st Sowing 8th May.		1st Pulling 11th October from 2nd Sowing 21st May.		2nd Pulling 3rd Nov. from 2nd Sowing 21st May.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
Mammoth White Intermediate	24	180	31	1140	19	445	25	490
Green Top White Orthe	23	1850	24	510	20	95	22	605
Giant White Vosges	23	200	28	1420	19	940	23	530
Iverson's Champion..............................	21	1230	28	265	16	1000	21	570
Improved Short White...........	21	570	26	360	21	240	20	1580
Half Long White..................................	20	1305	26	1955	17	980	20	1635
Half Long Chantenay	19	1270	19	1380	14	1810	17	660
Guerande or Ox-heart..............................	19	5	22	1210	12	475	19	280
Early Gem..	18	1345	19	280	14	1755	19	1765
White Belgian	18	740	16	670	15	1680	14	1370
Yellow Intermediate	17	45	17	980	15	95	15	1405
Carter's Orange Giant	13	400	16	1990	10	1505	13	1720
Long Orange or Surrey	11	1595	18	1785	10	625	14	1260
Scarlet Intermediate....	9	1140	10	790	7	1510	8	60
Long Scarlet Altringham	8	1490	10	1450	8	1380	7	1015

YIELD OF ROOTS PER ACRE, FROM EARLY AND LATE PULLING—*Concluded.*

	1st Sowing 1st Pulling.		1st Sowing 2nd Pulling.		2nd Sowing 1st Pulling		2nd Sowing 2nd Pulling.	
	Ton.	Lbs.	Tons	Lbs.	Tons	Lbs.	Tons	Lbs.
Average yield per acre from	18	91	21	412				
An average gain in 23 days of 3 tons 331 lbs. per acre								
Average yield per acre from					14	1,902	17	1,263
An average gain in 23 days of 2 tons 1,361 lbs. per acre								

The results of these experiments point to the advantage of leaving carrots in the ground as long as it is safe to do so before they are pulled.

FIELD PLOTS OF CARROTS,

The following six half-acre plots, were all sown in the same field, with the smaller plots of carrots. The soil was similar, and the preparation and treatment of the land the same.

Mammoth White Intermediate.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled on the 19th October. Yield per acre, 19 tons 200 pounds.

Improved Short White.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled 20th October. Yield per acre, 19 tons 1,762 pounds.

White Belgian.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled 21st October. Yield per acre, 15 tons 1,580 pounds.

Guerande or Ox-heart.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled 22nd October. Yield per acre, 17 tons 170 pounds.

Half Long White.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled 23rd October. Yield per acre, 20 tons 220 pounds.

Iverson's Champion.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled 25th October. Yield per acre, 22 tons 232 pounds.

EXPERIMENTS WITH SUGAR BEETS.

Twelve varieties of sugar beets were tested in 1897. The land was adjoining that of the test plots of carrots and mangels, the soil was similar, and the preparation and treatment of the land the same.

SUGAR BEETS—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot		Yield per Acre. 2nd Plot	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Danish Improved, Private Stock	May 8	May 21	Oct. 11	Oct. 11	25	820	847		18	850	614	10
Rennie's No. 98	" 8	" 21	" 11	" 11	25	160	836		16	1220	553	40
Rennie's No. 96 Red Top	" 8	" 21	" 11	" 11	23	200	770		18	960	616	
Improved Imperial	" 8	" 21	" 11	" 11	23	90	768	10	15	30	500	30
Rennie's No. 95	" 8	" 21	" 11	" 11	21	1890	731	30	20	1690	694	50
Rennie's No. 97	" 8	" 21	" 11	" 11	21	570	709	30	12	1960	432	40
Danish Red Top	" 8	" 21	" 11	" 11	20	1745	695	45	14	1755	495	55
Danish Improved,	" 8	" 21	" 11	" 11	19	5	633	25	13	1060	451	
Red Top Sugar	" 8	" 21	" 11	" 11	18	1620	627		16	1110	551	50
Wanzleben	" 8	" 21	" 11	" 11	18	1015	616	55	14	1205	486	45
Rennie's No. 99 Green Top	" 8	" 21	" 11	" 11	15	1790	529	50	12	750	412	30
Vilmorin's Improved	" 8	" 21	" 11	" 11	15	1680	528		15	745	512	25

EXPERIMENTS WITH POTATOES.

One hundred and ten varieties of potatoes have been under test during 1897, grown side by side, in similar soil, for the purpose of gaining information, as to their relative productiveness, and earliness of maturing. The soil in which they were planted, was a sandy loam of fair quality, which received in the spring of 1894, an application of about 12 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was pease. The land was ploughed in the autumn of 1896, about 8 inches deep, and again in the spring of 1897, about 6 inches deep, and harrowed twice with the smoothing harrow before planting.

The potatoes for seed were cut into pieces of from two to three eyes in each, and planted in rows $2\frac{1}{2}$ feet apart, with the sets about a foot apart in the rows. They were all planted on the 21st and 22nd of May and were dug from the 4th, to the 7th of October. The yield per acre has been calculated from the weight of tubers obtained from one row 132 feet long.

POTATOES—TEST OF VARIETIES.

Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Holborn Abundance....	402	36	400	24	2	12	356	24	44		White.
Seedling No. 230.......	400	24	400	24			380	36	19	48	"
French Red	392	42	382	48	9	54	317	54	64	54	Red.
From N. Bergeron.....	389	24	386	6	3	18	349	48	36	18	Light pink.
Seedling No. 7.	381	42	380	36	1	6	343	12	37	24	Bright pink.
Irish Daisy.............	372	54	369	36	3	18	341		28	36	White.
Chicago Market........	356	24	333	18	23	6	284	54	48	24	Pink.
Dreer's Standard......	346	38	346	38			324	38	22		White.
Earliest of All.........	346	30	331	6	15	24	257	24	73	42	Pink and white.
Northern Spy...	346	30	346	30			306	54	39	36	Bright pink.
From S. Sabean........	343	12	336	36	6	36	319		17	36	White.
Early Thorburn........	341		325	36	15	24	258	30	67	6	Pink and white.
Rose No. 9............	338	48	334	24	4	24					Pink.
Reeve's Rose...........	336	36	308		28	36	246	24	61	36	"
Vanier	333	18	333	18			256	18	77		Red.
Daisy	332	37	328	13	4	24	285	19	42	54	Pink and white.
Irish Cobbler...........	321	12	321	12			259	36	61	36	White.
Flemish Beauty Seedling	315	42	301	24	14	18	218	54	82	30	Bright pink.
London	315	42	304	42	11		255	12	49	30	Pink.
Everett.........	311	18	302	30	8	48	239	48	62	42	"
Early Sunrise	309	47	298	47	11		244	53	53	54	"
Reading Giant..........	302	30	302	30			221	6	81	24	Red and white.
Sharpe's Seedling......	300	18	292	36	7	42	213	24	79	12	Pink and white.
Blue Cup	298	6	298	6			254	6	44		Blue and white.
Troy Seedling........	297	44	297	44			266	56	30	48	White.
Delaware	296	38	295	54		44	282	42	13	12	"
Charles Downing.......	292	36	292	36			226	36	66		"
Late Puritan...........	287	22	282	58	4	24	234	34	48	24	"
Wonder of the World...	287	6	277	12	9	54	213	24	63	48	Pink and white.
New Variety No. 1.....	284	21	284	21			227	9	57	12	White.
State of Maine..........	283	15	283	15			254	39	28	36	"
Crown Jewel......	280	8	265	50	14	18	217	26	48	24	Pink and white.
Early Six Weeks.......	280	22	268	16	12	6	204	28	63	48	Pink.
Seattle	278	34	278	34			216	58	61	36	White.
Clarke's No. 1..........	278	18	275		3	18	237	36	37	24	Pink.
Early Ohio....	277	53	273	29	4	24	242	41	30	48	"
Seedling No. 2, Edwards	270	19	270	19			248	19	22		White.
Vick's Extra Early.....	269	30	267	18	2	12	210	6	57	12	Pink and white.
White Beauty.........	268	24	268	24			160	36	107	48	White.
Lightning Express......	268	24	266	12	2	12	248	36	17	36	Pink.
McKenzie	267	18	266	12	1	6	243	6	23	6	White.
Great Divide...........	266	12	258	30	7	42	206	48	51	42	"
Green Mountain..	266	12	261	48	4	24	246	24	15	24	"
American Wonder......	266	12	258	30	7	42	242		16	30	"

POTATOES—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Total Yield per Acre.		Yield per acre of Sound.		Yield per acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Early Rose	265	31	261	7	4	24	228	7	33		Pink.
Carman No. 1	265	22	265	22			249	58	15	24	White.
Dakota Red	264		264				243	6	20	54	Red.
Hale's Champion	264		264								White.
Money Maker	264		260	42	3	18	234	18	26	24	"
Early Gem	261	48	261	48			204	36	57	12	Pink.
American Giant	261	31	256	1	5	30	220	49	35	12	White.
Lizzie's Pride	260	42	254	6	6	36	225	30	28	36	Pink, red eye.
Freeman	260	42	260	42			207	54	52	48	White.
Burpee's Extra Early	259	36	254	6	5	30	204	36	49	30	Pink and white.
Algoma No. 1	258	22	252	52	5	30	206	40	46	12	Pink.
Ideal	255	12	222	12	33		212	18	9	54	"
Early White Prize	254	39	252	27	2	12	213	57	38	30	White.
Russell's Seedling	253		253				48	24	204	36	"
Thorburn	251	54	245	18	6	36	216	42	28	36	Pink and white.
Early Harvest	250	48	247	30	3	18	201	18	46	12	White.
Lee's Favourite	248	36	248	36			182	36	66		Pink.
Polaris	248	36	242		6	36	216	42	25	18	White.
Columbus	244	12	244	12			213	24	30	48	Pink and white.
King of the Roses	244	12	217	48	26	24	204	36	13	12	"
From E. Lortie	243	6	243	6			209		34	6	Light pink.
Record	243	6	214	30	28	36	177	6	37	24	White
Rochester Rose	242		236	30	5	30	205	42	30	48	Pink.
Early Norther	240	54	237	36	3	18	173	48	63	48	"
Prize Taker	238	42	236	30	2	12	207	54	28	36	"
Quaker City	237	36	237	36							White.
Bill Nye	237	36	237	36			206	48	30	48	"
Pride of the Table	237	3	235	57	1	6	220	33	15	24	Pink.
Beauty of Hebron	235	40	225	46	9	54	212	34	13	12	Pink and white.
Burnaby Seedling	234	1	226	19	7	42	196	37	29	42	"
Brown's Rot Proof	233	45	233	45			187	33	46	12	Pink.
Satisfaction	233	12	233	12			173	48	59	24	White.
Monroe County	232	6	227	42	4	24	181	30	46	12	Pink.
Fillbasket	231		211	12	19	48	184	48	26	24	Bright pink.
Pride of the Market	224	24	224	24			189	12	35	12	White.
Early Puritan	223	18	221	6	2	12	168	18	52	48	"
Victor Rose	218	54	210	6	8	48	179	18	30	48	Pink.
New Queen	218	46	213	16	5	30	192	22	20	54	Pink and white.
Queen of the Valley	218	37	214	13	4	24	204	19	9	54	Bright pink.
Napoleon	218	21	215	3	3	18	197	27	17	36	Pink.
Honeoye Rose	217	48	215	36	2	12	204	36	11		"
Harbinger	216	50	216	50			153	2	63	48	Pale pink.
Rural, No. 2	216	42	216	42			202	24	14	18	White.
Pearce's Extra Early	216	1	211	37	4	24	165	25	46	12	Pink.
Maggie Murphy	216	25	212	1	4	24	203	13	8	48	Bright pink.
World's Fair	214	55	214	55			181	55	33		White.
Hopeful	213	49	208	19	5	30	198	25	9	54	"
Empire State	211	53	211	53			148	5	63	48	"
Rural Blush	211	12	210	6	1	6	167	12	42	54	Pink.
Good News	209		209				143		66		"
Ohio Junior	209		202	24	6	36	151	48	50	36	"
Clay Rose	206	48	204	36	2	12	184	48	19	48	"
Carman No. 3	202	24	202	24			179	18	23	6	"
Brownell's Winner	202	24	202	24			147	24	55		Red.
Peerless Junior	187		183	42	3	18	159	30	24	12	White.
Houlton Rose	184	48	184	48							"
Table King	182	36	89	6	93	30	64	54	24	12	"
I. X. L.	179	18	179	18			166	6	13	12	Pink and white.
General Gordon	176	16	176	16			119	4	57	12	Pink.
Stourbridge Glory	161	42	161	42			117	42	44		White.
Sutton's Main Crop	159	30	158	24	1	6	143		15	24	"
Sutton's Abundance	151	48	151	48			112	12	39	36	"
Orphans	149	3	149	3			146	51	2	12	"
Seedling No. 214	139	42	139	42			134	12	5	30	"
Martins	106	42	106	42			58	18	48	24	Purple.
White Kidney	29	42	29	42			25	18	4	24	White.

FIELD PLOTS OF POTATOES.

The following fourteen plots of potatoes were grown in one field, the land was similar throughout, and the preparation and treatment was the same for all. The soil was a light sandy loam, which was manured in the spring of 1893, with about 18 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was oats. The land was ploughed in the spring of 1897, about 6 inches deep, and disc-harrowed once, and harrowed with the smoothing harrow once, then made into drills $2\frac{1}{2}$ feet apart for planting. In the following table the particulars are given of the results obtained :—

Name of Variety.	Size of Plot.	When planted.	Came up.	When dug.	Yield per Acre.	
	Acre.	1897.	1897.	1897.	Bush.	Lbs.
Early Rose	$\frac{1}{4}$	May 18..	June 12..	Oct. 5..	228	32
Burpee's Extra Early	$\frac{1}{7}$	" 8..	" 1..	Sept. 30..	202	47
Wonder of the World	$\frac{1}{8}$	" 18..	" 12..	Oct. 4..	191	51
Dakota Red	$\frac{1}{20}$	" 18..	" 13..	" 5..	191	32
May Queen Early	$\frac{1}{4}$	" 18..	" 12..	" 5..	187	42
American Wonder	$\frac{1}{11}$	" 18..	" 12 .	" 2..	167	32
Early Harvest	$\frac{1}{10}$	" 18..	" 12..	Sept. 30..	167	18
Carman No. 1	$\frac{1}{11}$	" 18..	" 12..	Oct. 1..	163	18
Burnaby Seedling	$\frac{1}{11}$	" 18..	" 13..	" 2..	155	59
Queen of the Valley	$\frac{2}{5}$	" 18..	" 12..	" 5..	152	53
Late Puritan	$\frac{1}{11}$	" 18..	" 12..	" 2..	149	57
Everett	$\frac{1}{11}$	" 18 .	" 12..	" 2..	141	11
Rochester Rose	$\frac{1}{11}$	" 18..	" 12..	Sept. 30..	137	19
I. X. L.	$\frac{1}{11}$	" 18..	" 14..	Oct. 3..	108	20

EXPERIMENTS WITH CLOVER.

To maintain the fertility of his land is the aim of every good farmer. A judicious rotation of crops, will economize the stores of plant food in the soil, but, where additions require to be made, of these elements of fertility, there are only two methods by which this can be accomplished—one is by applying to the land barn-yard manure, or artificial fertilizers, the other is the ploughing under of green crops, among which there are none so generally useful and valuable as clover. The great value of clover for ploughing under, to enrich the land has long been known, but it is only within the past few years, that the reason has been discovered why it is better for this purpose, than many other plants. The reason is that clover, in common with most other leguminous plants, has the power of taking nitrogen from the air, and laying up the store thus gathered in its roots and leaves, and when turned under, the added fertility becomesimmediately available for subsequent crops. If a clover plant is dug, it will be found to have a mass of fine branching roots, which spread in every direction, and penetrate deeply in the soil. If these roots are carefully examined, there will be found attached to them, many little nodules or swellings, each of which contains a colony of microbes, and these microscopic organisms are the active agents employed in taking nitrogen from the air, and converting it into plant food.

Further, the extensive root system which clover has, enables it to penetrate to depths in the soil and subsoil, which few other plants can reach and to bring from these lower strata, supplies of the mineral elements which growing plants require, and when the clover is turned under the decay of its roots and leaves, places within reach of subsequent crops, the additional stores of plant food gathered in the most readily available forms.

The ploughing under of green crops also improves the texture of the soil, and the organic matter thus added, makes the soil more retentive of moisture, thus giving more favourable conditions for subsequent plant growth. The ploughing under of any green crop will thus improve the soil, and besides this every plant used for this purpose, has the power of converting certain proportions of plant food, existing in the soil in insoluble forms, into soluble and available forms, and thus materially adding to the stores of food within reach of the next crop. Clover, however, in common with other leguminous plants, has great advantages over buckwheat, and other crops used for this purpose, from its power of permanently enriching the soil, by adding nitrogen from an extraneous source, and also of bringing from the lower strata of the soil, and subsoil, supplies of mineral food which other plants are unable to reach.

In the reports of the Director for 1895, pages 26 to 30, and 1896, pages 37 to 40, particulars were given of the results obtained from a series of important tests in the field, with different varieties of clover. These were planned and carried out with the object of gaining further information, as to the growth of different sorts of clover within given periods, what quantities of root and top were produced, when clover seed was sown in the spring with a grain crop, and ploughed under in October, also, the quantities turned under, when the clover was allowed to stand over and grow until the third week in the following May, then ploughed under for a crop of Indian corn or potatoes. Experiments were also carried on to determine what quantities of clover seed should be sown, to produce the best results, also to find out whether clover can be sown with grain, from year to year to plough under in the autumn, without lessening the crop of grain. If this can be done, the advantage to the land will be very great, for in addition to the benefits already referred to, the clover will serve as an excellent catch crop, absorbing and appropriating the nitrogenous fertilizers brought down by the rain, during late summer and autumn.

Since experiments of this nature need to be several times repeated in order to eliminate chances of error, arising from peculiarities of season and other conditions, a somewhat similar series of tests have been again made during the past season. It is not the purpose of the writer to discuss here, the relative economy of feeding clover to stock as compared with ploughing it under. There is no doubt that, when the clover area is limited, and the farmer has the stock to feed, it is more economical to pasture a field before ploughing it under, as the farmer will then make a profit on the cattle and still retain in the manure the cattle will give, nearly nine-tenths of the elements of fertility accumulated by the clover. The main object of these experiments, is to encourage the growing of clover generally with grain crops, as it is believed that large areas of land may thus be greatly improved, and rendered much more fertile—with a comparatively small outlay. In the annual report of the Experimental Farms for 1896, p. 39, mention is made of five acres of land devoted to plots, to show the effect of the ploughing under of clover. This field was divided into 20 one-quarter acre plots. These were all sown with grain, two plots of each sort, one with and one without clover, the grain used being wheat, two-rowed barley, six-rowed barley, oats and pease. Particulars as to the yield of grain from these plots, with and without clover, are given in the report referred to. The winter of 1896-97 was very severe, and when these plots were examined in the spring of 1897 the clover was almost entirely winter killed, and as it was not likely that the clover in this condition would give a fair indication as to what such a crop would do for the land under more favourable conditions it was thought best to begin these experiments over again somewhat modified.

PLOTS OF GRAIN SOWN WITH AND WITHOUT CLOVER.

Eight plots of $\frac{1}{20}$th acre each were used for this experiment. The soil was a sandy loam of fair quality, which was manured during the winter of 1895-96 with about 15 tons of barn-yard manure per acre, distributed over the ground in small heaps of about one-third of a cart load each. These were spread in the spring of 1896 and ploughed under about 5 or 6 inches deep. The previous crop was roots. The land was ploughed in the autumn of 1896 about 8 inches deep and disc-harrowed once in the spring, and

harrowed twice with the smoothing harrow before sowing. The plots were all sown on 5th May, two plots with each sort of grain, one of these in each case with Mammoth Red clover in the proportion of 10 pounds per acre, the other without clover. The wheat at the rate of $1\frac{1}{2}$ bushel barley 6-rowed, $1\frac{3}{4}$ bushel barley 2-rowed, 2 bushels and oats 2 bushels per acre. The wheat ripened 9th August, 6-rowed barley July 26th, 2-rowed barley 2nd August and the oats 9th August.

The following gives particulars of the crop:—

	Bushels.	Pounds.
No. 1—Preston wheat with 10 pounds clover per acre..	16	30
No. 2— " without clover................	19	00
No. 3—Odessa barley, 6-rowed, with clover...........	42	24
No. 4— " " without clover..........	37	34
No. 5—Bolton barley, 2-rowed, with clover............	37	4
No. 6— " " without clover.........	35	00
No. 7—Banner oats, with clover.	57	32
No. 8— " without clover..................	61	6

It is proposed to sow the whole area next year with one sort of grain and ascertain the yield from each of these plots.

EXPERIMENTS TO GAIN INFORMATION AS TO THE VALUE OF ROLLING AND HARROWING LAND SOWN WITH CLOVER, ALSO WITH DIFFERENT QUANTITIES OF CLOVER SEED PER ACRE.

The first four plots of $\frac{1}{20}$th acre each were sown on the 6th May with Banner oats, 2 bushels to the acre—10 pounds per acre of Mammoth Red clover was sown in each case with the grain. Notes were taken regarding the clover at the time of the cutting of the grain, 26th July, and again at the close of the season on the 27th October.

Plot 1. Not rolled or harrowed after sowing. Clover seed sown with grain, with attachment behind seed drill. Rain occurred four days after sowing, which afforded favourable conditions for the germination of the seed. 26th July, clover thick and even, some plants about 10 inches high. 27th October, growth strong and even, from 10 to 14 inches high, forming a thick mat for ploughing under; no bloom; yield of oats per acre, 55 bushels 10 pounds.

No. 2. Harrowed only after sowing, not rolled. 26th July, clover thin and uneven, 6 to 7 inches high. 27th October, growth strong and even, 10 to 14 inches high, forming a fine mat for ploughing under; yield of oats per acre, 56 bushels 6 pounds.

No. 3. Harrowed and rolled after sowing. 26th July, growth medium and even, 7 to 8 inches high. 27th October, growth strong and even; height, 10 to 14 inches, forming a dense mat of foliage for ploughing under; yield of oats, 50 bushels 20 pounds. per acre.

No. 4. Rolled only after sowing, not harrowed. 26th July, growth medium and even, 7 to 9 inches high. 27th October, growth very strong and even; height, 10 to 14 inches, forming a very dense mat of foliage for ploughing under; yield of oats per acre, 54 bushels 4 pounds.

Plots 5 to 19 were sown with Odessa barley, using different quantities of clover seed per acre, and on three plots left as check plots no clover seed was used. The soil was a sandy loam of fair quality, which received about 12 tons of barn-yard manure per acre in the fall of 1896, after which the land was ploughed about 8 inches deep. In the spring it was disc-harrowed once and harrowed twice with the smoothing harrow before sowing.

Plot 5. Sown 6th May with Odessa barley, $1\frac{3}{4}$ bushel per acre; grain sown with drill; 4 pounds Mammoth Red clover per acre sown by hand. 26th July, growth thin and even, 5 to 6 inches high. 27th October, growth fairly strong and even, but too thin either for meadow or for ploughing under; no bloom; yield per acre of barley, 38 bushels 46 pounds.

Plot 6. Sown 6th May with Odessa barley only, no clover used. Yield of grain per acre, 40 bushels 20 pounds.

Plot 7. Sown 6th May with Odessa barley, with 6 pounds Mammoth Red clover per acre. 26th July, growth even and medium, 6 to 7 inches high. 27th October, growth medium, but very even; height, 10 to 12 inches; thick enough to leave for meadow, but not thick enough for ploughing under; yield of barley, 39 bushels 18 pounds per acre.

Plot 8. Sown 6th May with Odessa barley, with 8 pounds Mammoth Red clover per acre. 26th July, growth medium and even, 6 to 7 inches high. 27th October, growth strong and very even; almost too thick for meadow, but scarcely thick enough for best results when ploughed under; yield of barley 40 bushels per acre.

Plot 9. Sown 6th May with Odessa barley, with 10 pounds Mammoth Red clover per acre. 26th July, growth even but thin, 5 to 6 inches high. 27th October, growth very strong and even; height, 10 to 12 inches; too thick to leave for meadow; made a fine thick mat for ploughing under; yield of barley, 43 bushels 36 pounds per acre.

Plot 10. Sown 6th May with Odessa barley, with 12 pounds of Mammoth Red clover per acre. 26th July, growth fairly even; 6 to 7 inches high. 27th October, growth strong and very even; height 10 to 14 inches, making a compact mat for ploughing under. Yield of barley, 46 bushels 2 pounds per acre.

Plot 11. Sown 6th May with Odessa barley, with 14 pounds Mammoth Red clover per acre. 26th July, growth medium and even, 6 to 7 inches high. 27th October, growth very strong and even, forming a thick mat but did not appear to be any better for ploughing under than where 10 or 12 pounds of clover seed had been used. Yield of barley, 45 bushels per acre.

Plot 12. Sown 6th May with Odessa barley, with 10 pounds of Common Red clover per acre. 26th July, growth strong and even, 9 to 10 inches high. 27th October, growth strong, even and thick, making a very fine mat of foliage for ploughing under; height 12 to 14 inches; a large number of the plants were in bloom. Yield of barley, 43 bushels 46 pounds per acre.

Plot 13. Sown 6th May with Odessa barley only, no clover used. Yield of grain, 42 bushels 14 pounds per acre.

Plot 14. Sown 6th May with Odessa barley, with 14 pounds Alfalfa per acre. 26th July, growth even but rather thin, 9 to 10 inches high. 27th October, growth strong and even, but thin; thick enough for meadow but not thick enough for ploughing under. Stalks rather woody and tough, height 12 to 14 inches. Yield of barley, 31 bushels 32 pounds per acre. In this instance the barley was thin on the ground due possibly to variation in the soil.

Plot 15. Sown 6th May with Odessa barley only, no clover used. Yield of grain, 41 bushels 32 pounds per acre.

Plot 16. Sown 6th May with Odessa barley, with 24 pounds Crimson clover per acre. 26th July, growth thin. 27th October, growth thin and even, height 6 to 8 inches; not thick enough for ploughing under. Yield of barley, 36 bushels 22 pounds per acre.

Plot 17. Sown 6th May with Odessa barley, with 6 pounds Alsike clover per acre. 26th July, growth thin but even, and about 5 inches high. 27th October, growth medium and even, height about 6 inches; not thick enough for meadow nor for ploughing under with advantage. Yield of barley, 45 bushels 20 pounds per acre.

Plot 18. Sown 6th May with Odessa barley, with 6 pounds Alsike clover and 14 pounds Orchard grass per acre. 26th July, growth medium and even, height 5 to 6 inches. 27th October, growth medium and even, height 6 to 8 inches; both clover and grass thick enough to make a good meadow. Yield of barley, 43 bushels 16 pounds per acre.

Plot 19. Sown 6th May with Odessa barley, with 14 pounds Alfalfa and 14 pounds Orchard grass per acre. 26th July, growth of Alfalfa thin and even and 10 to 11 inches high, orchard grass fairly even, 7 to 8 inches high. 27th October, Alfalfa fairly thick and even, average height 14 inches; orchard grass 8 to 9 inches, thick enough to make a good meadow. Yield of barley 37 bushels 24 pounds per acre.

SOWING OF FIELDS OF GRAIN WITH CLOVER.

Since our experiments have shown that clover can be grown with fields of grain in the manner described without lessening the yield of grain for the year, the following fields were thus treated, all being sown with Mammoth Red clover in the proportion of 10 pounds to the acre.

Improved Ligowo oats. A field of 4½ acres of a clay loam was sown with this variety of oats on 30th April and 10 pounds of Mammoth Red clover seed used per acre. The oats were cut on 2nd August and gave a crop of 44 bushels 10 pounds per acre. By the middle of October the clover had made a thick and even growth about 10 or 12 inches high. Although the catch of clover in this case was very fair the plants were not so thick on the ground as those in the plots where the land was lighter, the clover roots, however, were stronger and thicker.

				Bushels.	Pounds.
Oats—Early Gothland,	2	acres;	yield per acre..........	40	20
" Golden Beauty,	2	"	"	41	11
" Flying Scotchman,	1	acre	"	35	22
" Columbus,	1	"	"	36	8
" Early Golden Prolific,	1	"	"	37	6
" White Schonen	1	"	"	38	23
" Early Archangel,	1	"	"	34	23
" Siberian,	1¾	"	"	48	9
" American Beauty,	2½	"	"	50	12
" Mortgage Lifter,	1½	"	"	39	15
" Joanette,	1¾	"	"	33	3
" Holstein Prolific,	1¼	"	"	46	2
" Wallis	2½	"	"	46	32
Wheat—Advance,	½	"	"	25	1
" Herisson Bearded,	½	"	"	25	58
" Preston,	½	"	"	28	42
Barley—Royal, 6-rowed,	2½	"	"	29	42
" Trooper "	2⅓	"	"	26	15
" Mensury "	2¾	"	"	36	47
" Champion "	½	"	"	43	46
" Success "	½	"	"	43	29
" Odessa "	¾	"	"	37	10

This makes a total of 35½ acres of field plots of grain which were sown with clover for ploughing under, in addition to 16½ acres seeded for meadow. In every case the clover made a strong and even growth, and formed a good mat of foliage, which filled the soil well with fibrous roots. The clover, with one or two exceptions, was all ploughed under about the end of October.

WEIGHT OF CLOVER LEAVES, STEMS AND ROOTS PER ACRE.

In the field of Improved Ligowo oats—on clay loam—a small area, 4 feet by 4 (16 square feet), was dug to the depth of 9 inches and all the roots and tops of the clover carefully gathered and weighed. The same was done with nine of the smaller plots, and the weight of the material thus gathered estimated per acre.

From field sown 30th April with Ligowo oats, with 10 pounds Mammoth Red clover per acre:—

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre..	5	209
" roots per acre...........	3	296
Total..........................	8	505

From the following plots, all on sandy loam, the appended results were obtained :—

Plot 5. Sown with Odessa barley, 6th May, with 4 pounds Mammoth Red clover per acre :—

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	2	1,445
" roots per acre..........	2	1,105
Total..........................	5	550

Plot 7. Sown with Odessa barley, 6th May, with 6 pounds Mammoth Red clover per acre :—

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	3	849
" roots per acre..........	2	1,147
Total..........................	5	1,996

Plot 8. Sown with Odessa barley, 6th May, with 8 pounds Mammoth Red clover per acre :—

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	3	934
" roots per acre..........	3	40
Total..........................	6	974

Plot 9. Sown with Odessa barley, 6th May, with 10 pounds Mammoth Red clover per acre :—

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	4	508
" roots per acre..........	2	1,785
Total..........................	7	293

Plot 10. Sown with Odessa barley, 6th May, with 12 pounds Mammoth Red clover per acre.

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	3	1,997
" roots per acre..........	2	1,615
Total..........................	6	1,612

Plot 11. Sown with Odessa barley, 6th May, with 14 pounds Mammoth Red clover per acre.

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	3	1,657
" roots per acre..........	2	849
Total..............................	6	506

Plot 12. Sown with Odessa barley, 6th May, with 10 pounds Common Red clover per acre.

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	5	209
" roots per acre.........	3	296
Total..............................	8	505

Plot 14. Sown with Odessa barley, 6th May, with 14 pounds Alfalfa per acre.

	Tons.	Pounds.
Dug 20th Oct.—Weight of Alfalfa leaves and stems per acre	1	1,745
" roots per acre........	1	1,572
Total..............................	3	1,317

Plot 17. Sown with Odessa barley, 6th May, with 6 pounds Alsike clover per acre.

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre	2	847
" roots per acre.........	2	1,360
Total..............................	5	207

Some idea may be formed of the value of this crop turned under when we consider that each ton of the mixed leaves, stems and roots will add as much nitrogen to the soil as 2 tons of average barn-yard manure, while the essential mineral fertilizing constituents gathered from depths to which the roots of many other plants do not reach, make the clover plant an important enricher of the soil in these ingredients also.

EXPERIMENTS WITH HORSE BEANS.

Two field plots were sown with horse beans during 1897. The soil was a sandy loam of fair quality, rather heavy, which was manured during the winter of 1896-97 with about 15 tons of barn-yard manure per acre. The manure was put out in small heaps of about one-third of a cart load each and spread in the spring and ploughed under about 6 inches deep, then harrowed with the smoothing harrow twice before planting. The beans were planted with the seed drill in rows three feet apart, using about 50 pounds of seed per acre.

Plot 1. One acre. Tick Beans, imported seed. Sown 14th May, came up 31st May, and was cut for ensilage 18th September, when the plants were still green. The growth was medium to strong, vines well podded, a few beginning to ripen. Height 4 to 5 feet. Blight was first noticed on the vines on 7th July but afterwards almost disappeared. Yield per acre, 9 tons 320 pounds.

Plot 2. $1\frac{1}{4}$ acres. This was adjoining plot 1, on similar soil and the land had similar preparation and treatment. The seed was also of the variety known as "Tick," but Canadian grown. Sown 14th May, came up 31st May, and was cut for ensilage 20th and 21st September. The growth was medium to strong and even. Height 4 to $4\frac{3}{4}$ feet, vines well podded and a larger proportion ripe than on the vines grown from the imported seed. Yield per acre, 7 tons 525 pounds.

Horse beans were grown on the Central Experimental Farm first in 1892, but that year they were sown mixed with corn. None were sown separately, and no estimate was made that season as to the weight of fodder produced per acre by the horse beans. The $\frac{41}{100}$th acre plot mentioned on page 80, Report 1892, were Broad Windsor beans. In 1893 horse beans were again sown with Indian corn to the extent of 12 acres, and the average weight of the fodder produced by the beans was 1 ton 765 pounds per acre. Two acres were also sown as a separate field crop that year with much better returns, and since then horse beans have been grown each year as a separate field crop.

The average returns have been as follows:—

	Tons.	Pounds.
1893, average yield per acre..........................	8	927
1894 "	12	896
1895 "	7	276
1896 "	2	1,918
1897 "	8	423

The very light crop in 1896 was mainly due to the prevalence of blight

EXPERIMENTS WITH SOJA BEANS.

(Soja hispida.)

The Soja or Soya bean is an annual leguminous plant, somewhat resembling the upright varieties of the cow pea. These beans are extensively used in Japan as food, both for men and animals. They may also be utilized as a soiling crop, as hay, and as ensilage. There are several varieties of these beans, some of which are much earlier than others, one late variety was tried which appears to be of little or no value, and one early variety which gave a large crop and promises to be exceedingly useful.

The soil on which the late variety was sown was adjoining the horse beans, the land was of similar character, and had the same treatment, the early variety was sown on a light sandy loam, which was manured in the autumn of 1895 with about 12 tons of barn-yard manure per acre. The previous crop was pease. This land was ploughed late in the autumn of 1896, about 9 inches deep, and disc-harrowed in the spring, and harrowed with smoothing harrow before sowing.

Soja beans, late variety, sown 14th May, came up 3rd June, and was cut for ensilage 24th September. The growth was strong and even, but the plants had been slightly injured by frost. There were no pods on the vines. Height 42 to 48 inches. Yield per acre, 1 ton 1,957 pounds. This variety is too late to be of value here.

Early Soja beans. These were received from Peter Henderson & Co., seedsmen, of New York, in the spring of 1897. The seed was sown in rows nine inches apart, and enough was received to sow a plot of 12 by 15 feet. Sown 25th May; came up 6th June, and was cut 25th September. The plants made very strong growth, they were very leafy and grew to an average height of 3 feet 9 inches. The vines were well podded, pods thickly distributed on branches from 18 inches above ground to the tips. The beans in the pods were more than half grown at the time of cutting. The weight of green fodder cut from this plot was 127½ pounds, equal to a yield of 15 tons 855 pounds per acre. As this plant is said to endure hot, dry weather, it is hoped that it may be found useful to grow for ensilage in those districts where horse beans have not succeeded. As a nutritious and nitrogenous food for animals, the analyses which have been published of this plant, show that it compares favourably with the horse bean. We hope to give this promising fodder plant a more extended trial during the coming season.

EXPERIMENTS WITH SUNFLOWERS.

Two field plots covering 1½ acre were sown with this crop. The soil was a sandy loam which was manured in the spring of 1895 with about 12 tons of barn yard manure per acre; no fertilizer has been applied since. The previous crop was oats. After the oats were harvested in 1896 the land was ploughed shallow and harrowed with the smoothing harrow to start weed seeds and shed grain and ploughed later in the autumn about 8 inches deep. In the spring of 1897 the land was disc-harrowed twice, harrowed twice with the smoothing harrow and rolled before sowing. The seed was sown with a Planet Junior hand seed drill in rows 3 feet apart, using 3 to 4 pounds of seed per acre, and the plants were thinned out when they were 3 or 4 inches high so as to leave them from 16 to 18 inches apart in the rows.

Plot 1.—One acre. Mammoth Russian Sunflowers—black-seeded variety. Sown 1st May; came up 10th May and the heads were cut for the silo on 18th September. The plants were of strong and even growth and the yield of heads was 7 tons 237 pounds per acre.

Plot 2.—One-half acre. Mammoth Russian Sunflowers—light coloured seed. Sown 1st May; came up 10th May and the heads were cut for the silo 17th September. The growth was strong and even and the seeds fairly well ripened. Yield of heads per acre, 7 tons 580 pounds.

Sunflower heads were first grown as a field crop at the Central Experimental Farm in 1892, and have been grown each year since and used to advantage in a mixed ensilage known as the Robertson Mixture, composed of Indian corn, horse beans and sunflower heads. In harvesting the sunflowers the heads only have been cut and have yielded as follows:—

	Tons.	Pounds.
1892, ½ acre. Yield of heads per acre	7	486
1893, 3 acres—stalks levelled to the ground by a severe storm—average yield per acre................	3	295
1894, 6½ acres " "	3	1,998
1895, 3 acres " "	5	1,924
1896, 1½ acre " "	7	1,823
1897, 1½ acre " "	7	350

An average for the 6 years of 5 tons 1,813 pounds per acre.

In 1894 three experiments were tried to ascertain the proportion of seeds contained in sunflower heads. In the first 315¾ pounds were shelled giving 74¾ pounds of clean seed, or about 24 per cent. In the second 474¾ pounds of heads were used giving 112¼ pounds of clean seed, rather less than 24 per cent. In the third experiment 165 pounds of heads were used giving 33¼ pounds of clean seed, a fraction over 20 per cent. The first two experiments were with the black variety of the Russian seed, the last was with the light coloured variety. The average yield from the three experiments was about 23 pounds of seeds from each 100 pounds of sunflower heads. The seeds are said to contain 20½ per cent of oil and 15·88 of albuminoids.

EXPERIMENT WITH BUCKWHEAT.

One plot of about $\frac{6}{10}$ths of an acre was sown with buckwheat. The soil was a sandy loam which had been used as a nursery for young forest trees for the past 10 years and had not received any manure or other fertilizer. The land was ploughed in the autumn of 1896 about 8 inches deep and disc-harrowed and harrowed with the smoothing harrow several times before sowing. Sown 23rd June, 3 pecks per acre of the variety known as Silver Hull, came up 28th June and was ripe 15th September. The time to mature was 79 days. Yield per acre 30 bushels 16 pounds.

EXPERIMENTS WITH FLAX.

The experiments with flax, begun in 1896, were repeated in 1897. This year, however, none of the flax was pulled but all was cut with the scythe which, as the flax was fully ripe, caused the seed to shed badly and thus reduced the yield. The soil was a sandy loam of medium to poor quality, which received a dressing of about 12 tons per acre of barn-yard manure during the winter of 1895-96. No fertilizer has been applied since. The previous crop was roots. The land was ploughed in the autumn of 1896 about 8 inches deep and disc-harrowed once in the spring and harrowed twice with the smoothing harrow before sowing each set of plots. The seed was sown broadcast by hand and lightly harrowed to cover it, after which the land was rolled.

FIRST SOWING.

Plot 1. Forty pounds of seed per acre. Sown 5th May, came up 12th May and was ripe 14th August. Made a strong and even growth, all standing well.

Weight of straw per acre........................ 3,220 pounds.
Yield of seed per acre......... .... 8 bushels 42 pounds.

Plot 2. Eighty pounds of seed per acre. Seed sown and ripened same dates as plot 1. Made a strong and even growth but was considerably lodged.

Weight of straw per acre........................ 3,530 pounds.
Yield of seed per acre...................... 6 bushels 34 pounds.

SECOND SOWING.

Plot 3. Forty pounds of seed per acre. Sown 12th May, came up 19th May and was ripe 16th August. Made a strong and even growth; all standing well.

Weight of straw per acre.................... 3,130 pounds
Yield of seed per acre...................... 8 bushels 52 pounds.

Plot 4. Eighty pounds of seed per acre. Seed sown and ripe on same dates as plot 3. Made a strong and even growth; a few spots lodged.

Weight of straw per acre.................... 4,420 pounds.
Yield of seed per acre...................... 6 bushels 44 pounds.

THIRD SOWING.

Plot 5. Forty pounds of seed per acre. Sown 19th May; came up 25th May, and was ripe 17th August. Made a strong and even growth; a few spots lodged.

Weight of straw per acre.................... 3,770 pounds.
Yield of seed per acre...................... 9 bushels 26 pounds.

Plot 6. Eighty pounds of seed per acre. Seed sown and ripe on same dates as plot 5. Made a strong and even growth, all standing well.

Weight of straw per acre.................... 3,230 pounds.
Yield of seed per acre...................... 7 bushels 48 pounds.

FOURTH SOWING.

Plot 7. Forty pounds of seed per acre. Sown 26th May; came up 1st June, and was ripe 25th August. Made a medium and even growth, all standing well.

Weight of straw per acre.................... 3,520 pounds.
Yield of seed per acre...................... 10 bushels 30 pounds.

Plot. 8. Eighty pounds of seed per acre. Sown 26th May; came up 1st June, and was ripe 23rd August. Made a strong and even growth; a few small spots lodged.

Weight of straw per acre.................... 3,460 pounds.
Yield of seed per acre...................... 9 bushels 16 pounds.

The cutting with the scythe, as compared with pulling in 1896, very much lessened the weight of the straw, as well as diminishing the quantity of seed saved.

BROMUS INERMIS.

AWNLESS BROME GRASS.

One acre of this grass was sown in the spring of 1896 with Odessa barley. This was reported on in the annual report of the Experimental Farms for 1896, page 40. This grass wintered well and made a rapid and early growth in the spring, the field being quite green before timothy had made a start. The plants, however, were too thin to entirely cover the ground. The quantity of seed sown per acre was 18 pounds, which is usually sufficient to make a thick mat of growth the second year. Possibly in this instance the seed did not all germinate, some of it may have been too deeply covered. A crop of hay was cut on the 6th of July when the brome grass measured on an average three feet high and yielded 1 ton 1,210 pounds of cured hay to the acre. Timothy gave about 1½ ton per acre. Had this grass been thicker on the ground, the crop would no doubt have been considerably heavier. Later in the season a good aftermath was produced, and the grass thickened up and covered the ground better. The farm animals eat the hay made from this grass very readily. It seems altogether probable that Awnless Brome grass in the eastern parts of Canada will prove valuable, as it has already done in the North-west, both for hay and pasture.

TESTS OF THE ACTION OF FERTILIZERS ON SOME CROPS.

In the annual report of the Experimental Farms for 1893, details were given on pages 8 to 24 of the results of a series of tests which were carried on during the previous five or six years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important crops. The particulars there given covered the results of six years' experience with crops of wheat and Indian corn, and five years' experience with crops of oats, barley, turnips and mangels. The results of similar tests conducted for three years with carrots and one year with sugar beets were also given.

These experiments have been continued; and as explanatory regarding the preparations made and the general plan, together with the way in which they have been carried on, the following paragraphs are quoted from the report of 1893 :

"A piece of sandy loam, more or less mixed with clay, which was originally covered with heavy timber, chiefly white pine, was chosen for these tests. The timber was cut many years ago, and among the stumps still remaining when the land was purchased, there had sprung up a thick second growth of trees, chiefly poplar, birch and maple, few of which exceeded six inches in diameter at the base. Early in 1887, this land was cleared by rooting up the young trees and stumps and burning them in piles, on the ground from which they were taken, the ashes being afterwards distributed over the soil as evenly as possible, and the land ploughed and thoroughly harrowed. Later in the season it was again ploughed and harrowed, and most of it got into fair condition for cropping."

"The plots laid out for the experimental work with fertilizers were one-tenth of an acre each, 21 of which were devoted to experiments with wheat, 21 to barley, 21 to oats, 21 to Indian corn or maize, and 21 to experiments with turnips and mangels. Owing to the difficulty and unavoidable delay attending the draining of some wet places, it was not practicable to undertake work on all the plots the first season. The tests were begun in 1888 with 20 plots of wheat and 16 of Indian corn; and in 1889 all the series were completed excepting six plots of roots, Nos. 16 to 21 inclusive, which were available for the work in 1890." In all cases the plots in each series have been sown on the same day.

"In 1890 it was found that all the grain plots had become so weedy that the growth of the crops was much interfered with, and with the view of cleaning the land one-half of each of the wheat and oat plots was sown with carrots in 1891, and one-half of each of the barley plots with sugar beets. In 1892 the other half of each plot in each of these series was sown with carrots. In 1893 it was thought desirable to continue this cleaning process, and carrots were again sown on the half of the wheat and oat plots occupied with this crop in 1891, and also on the half of the barley plots cropped with sugar beets that year." In 1894, 1895, 1896 and 1897 the one-half of the oat plots were sown again with carrots and the half of the plots devoted to wheat and barley were planted with potatoes.

TREATMENT OF SOIL.

"The treatment of the soil on all the grain plots has been to gang-plough soon after harvest, and after the shed grain and weeds have well started to plough again about seven inches deep. In spring the plots have been disc-harrowed twice or gang-ploughed once before applying the fertilizers, and again harrowed with the toothed or smoothing harrow before sowing. On those plots where barn-yard manure has been used, the manure has been lightly ploughed under as soon as possible after it has been spread on the land and harrowed with the smoothing harrow before sowing. Wherever barn-yard manure is spoken of, it is understood to be a mixture of horse and cow manure in about equal proportions."

It is proposed to give each year in the annual report a summary of these permanent fertilizer plots, taking the average yield of the whole of the previous period, adding the results of the current year, and then giving the average yield for the full time. The experience of each year will add materially to the value and reliability of the tests for the whole period.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of 1½ bushel per acre, excepting in 1894; and the varieties used were as follows. In 1888-89-90 and 1891 White Russian, and in 1892-93 Campbell's White Chaff. In 1894 the Rio Grande wheat was used, and shortly before sowing, it was tested as to vitality and found to be very deficient in germinating power, less than half the kernels sprouted. As it was not practicable then to secure better seed, double the usual quantity of seed was sown, namely, three bushels per acre, which gave a proportion of growth on each plot of about the usual thickness. In 1895, 1896 and 1897 the Red Fife wheat was used in the usual quantity of 1½ bushel per acre. In 1897 the Red Fife was sown 5th May, came up 12th May and was harvested 10th August, requiring from the date of sowing to maturity a period of 97 days.

The season of 1897 at Ottawa has been fairly good for the growing of spring wheat, and has given crops somewhat above the average. This year the plot on which the fresh manure was used has yielded 1 bush. and 50 lbs. per acre more than that on which the rotted manure was used. This gain has been more than sufficient to offset the gain of the rotted manure plot in 1895, and the fresh manure plot now averages a little higher than any other plot in the series.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Nine Years.			10th Season, 1897. Variety, Red Fife.			Average Yield for Ten Years.		
		Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year since....	19	$36\frac{6}{9}$	3,486	23	30	4,070	20	..	3,544
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year since.........	19	29	3,528	25	20	4,230	20	$4\frac{1}{10}$	3,598
3	Unmanured........................	10	$24\frac{4}{9}$	1,855	12	20	2,000	10	36	1,869
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre............	10	$23\frac{8}{9}$	1,828	12	..	2,430	10	$33\frac{5}{10}$	1,893
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre..	12	$22\frac{2}{9}$	2,851	15	50	3,290	12	43	2,895
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed, and allowed to heat for several days before using...	17	$11\frac{6}{9}$	3,007	24	40	2,980	17	$56\frac{5}{10}$	3,004
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre......	12	$38\frac{2}{9}$	2,096	14	40	3,020	12	$50\frac{4}{10}$	2,188
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.........................	10	$37\frac{2}{9}$	1,715	13	..	1,490	10	$51\frac{5}{10}$	1,693
9	Mineral superphosphate, No. 1, 500 lbs. per acre	11	$46\frac{1}{9}$	1,699	12	10	2,090	11	$48\frac{5}{10}$	1,738
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre......	12	$53\frac{3}{9}$	2,928	15	29	3,320	13	8	2,967
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre...........	13	10	2,603	19	30	3,330	13	48	2,676
12	Unmanured............................	10	$1\frac{1}{9}$	1,651	9	30	1,490	9	58	1,635
13	Bone finely ground, 500 lbs. per acre......	11	$13\frac{6}{9}$	1,812	17	..	1,765	11	$48\frac{3}{10}$	1,807
14	Bone finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre...........	14	$29\frac{1}{9}$	2,182	22	20	2,620	15	$16\frac{5}{10}$	2,225
15	Nitrate of soda, 200 lbs. per acre..........	13	$31\frac{6}{9}$	2,316	15	30	2,330	13	$43\frac{6}{10}$	2,316
16	Muriate of potash, 150 lbs. per acre.	15	$20\frac{6}{9}$	1,944	18	..	2,310	15	$36\frac{3}{10}$	1,981
17	Sulphate of ammonia, 300 lbs. per acre....	11	$35\frac{7}{9}$	2,343	15	40	2,260	12	$0\frac{2}{10}$	2,335
18	Sulphate of iron, 60 lbs. per acre.........	12	$18\frac{3}{9}$	1,911	17	30	1,230	12	$49\frac{5}{10}$	1,843
19	Common salt (Sodium chloride) 300 lbs. per acre	12	$28\frac{8}{9}$	1,693	20	25	1,015	13	$16\frac{5}{10}$	1,625
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre......................	12	$36\frac{6}{9}$	1,925	16	..	1,450	12	57	1,878
21	Unmanured in 1889, mineral superphosphate, No. 2, 500 lbs. per acre, each year since.......................... .	12	12	1,846	15	50	1,890	12	$33\frac{8}{10}$	1,850

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in 1889, 1890 and 1891, $1\frac{1}{2}$ bushel in 1892 and 1893, and 2 bushels in 1894, 1895, 1896 and 1897. Two-rowed barley has been used for seed throughout the whole period. The varieties used were as follows: 1889, 1890 and 1891, Saale; 1892, Goldthorpe; 1893, Duck-bill; and

in 1894, 1895, 1896 and 1897 Canadian Thorpe, a selected form of the Duck-bill. In 1897 the Canadian Thorpe was sown 5th May, came up 12th May and was harvested 3rd August, requiring from the date of sowing to maturity a period of 90 days.

In 1897 the yield of all the barley plots but one was higher than the average of past seasons. The plot fertilized with fresh barn-yard manure has given a better yield than the plot where the manure was used rotted; and this plot still averages 1 bush. 3 lbs. higher than that of the rotted manure for the nine years these tests have been continued.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY, $\frac{1}{10}$TH ACRE.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Eight Years.			9th Season, 1897. Variety, Canadian Thorpe.			Average Yield for Nine Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	32	36$\frac{1}{8}$	2,954	42	44	3,840	33	42$\frac{3}{9}$	3,052
2	Barn-yard manure, fresh, 15 tons per acre	33	43	3,252	43	21	3,725	34	45$\frac{7}{9}$	3,305
3	Unmanured	14	8$\frac{5}{8}$	1,592	15	10	1,590	14	14$\frac{1}{9}$	1,592
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	14	15$\frac{7}{8}$	1,446	16	12	1,600	14	26$\frac{1}{9}$	1,463
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre	19	15$\frac{1}{8}$	2,191	23	16	2,490	19	36$\frac{5}{9}$	2,224
6	Barn-yard manure, partly rotted, and actively fermenting, 6 tons per acre: mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	26	29$\frac{1}{8}$	2,468	41	2	2,450	28	10$\frac{1}{9}$	2,466
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre.	22	5$\frac{5}{8}$	2,472	30	..	1,860	22	47$\frac{6}{9}$	2,404
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	18	25$\frac{3}{8}$	1,725	29	18	1,520	19	35$\frac{3}{9}$	1,702
9	Mineral superphosphate No. 1, 500 lbs. per acre	21	7	2,023	27	24	2,020	21	36$\frac{4}{9}$	2,023
10	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	25	21$\frac{7}{8}$	2,428	37	4	2,645	26	35$\frac{3}{9}$	2,452
11	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	24	12$\frac{3}{8}$	2,521	42	24	2,940	26	13$\frac{6}{9}$	2,568
12	Unmanured	13	20$\frac{3}{8}$	1,233	16	22	1,310	13	36$\frac{5}{9}$	1,242
13	Bone, finely ground, 500 lbs. per acre	14	8	1,340	13	46	1,660	14	6$\frac{8}{9}$	1,376
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	21	16$\frac{3}{8}$	2,012	28	16	2,080	22	5$\frac{6}{9}$	2,020
15	Nitrate of soda, 200 lbs. per acre	21	40$\frac{3}{8}$	2,508	30	10	2,150	22	37$\frac{3}{9}$	2,468
16	Muriate of potash, 150 lbs. per acre	22	4	1,994	25	40	1,570	22	24	1,947
17	Sulphate of ammonia, 300 lbs. per acre	17	45$\frac{7}{8}$	2,144	19	8	1,460	18	4$\frac{3}{9}$	2,068
18	Sulphate of iron, 60 lbs. per acre	18	20$\frac{3}{8}$	1,842	21	2	1,410	18	34$\frac{3}{9}$	1,794
19	Common salt (Sodium chloride) 300 lbs. per acre	27	15$\frac{3}{8}$	2,071	39	8	2,720	28	30$\frac{4}{9}$	2,143
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre	20	18$\frac{1}{8}$	1,786	23	26	1,610	20	35	1,766
21	Mineral superphosphate No. 2, 500 lbs. per acre	20	31$\frac{3}{8}$	1,711	29	28	1,800	21	30$\frac{8}{9}$	1,721

OAT PLOTS.

The quantity of seed sown per acre on the oat plots was 2 bushels in 1889 and 1890; 1½ bushel in 1891, 1892 and 1893, and 2 bushels in 1894, 1895, 1896 and 1897. The varieties used were as follows: In 1889, Early English; 1890, 1891, 1892, 1893, Prize Cluster; and in 1894, 1895, 1896 and 1897, Banner. In 1897 the Banner was sown 5th May, came up the 13th May, and was harvested 9th August, requiring from the date of sowing to maturity a period of 96 days. In every instance this year, excepting that of plots Nos. 4 and 12, the yield of oats has been considerably above the average of the previous eight years. The crop of plot 2 fertilized with fresh barn-yard manure has again exceeded that of plot 1, treated with rotted manure and the average of the former for nine years now stands 6 bushels 26 pounds higher than that of the latter.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS, 1/10TH ACRE.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Eight Years. Yield of Grain. Per acre.		Average Yield for Eight Years. Yield of Straw. Per acre	9th Season, 1897. Variety Banner. Yield of Grain. Per acre.		9th Season, 1897. Variety Banner. Yield of Straw. Per acre	Average Yield for Nine Years. Yield of Grain. Per acre.		Average Yield for Nine Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre....	43	23	3,039	70	30	4,410	46	23 7/9	3,191
2	Barn-yard manure, fresh, 15 tons per acre.	50	8 6/8	3,318	80		4,520	53	19 4/9	3,452
3	Unmanured....	30	3 1/8	1,608	37	32	1,170	30	32 7/9	1,559
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre....	30	24 6/8	1,843	28	33	1,545	30	18 4/9	1,810
5	Mineral phosphate, untreated, finely ground; 500 lbs., nitrate of soda, 200 lbs. per acre....	46	31	2,837	58	8	2,240	48	5 7/9	2,771
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using....	40	28 6/8	2,670	68	18	2,590	43	31 3/9	2,661
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre....	42	23 7/8	3,316	57	22	2,705	44	12 3/9	3,248
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	37	11 3/8	2,442	64	14	1,850	40	11 6/9	2,376
9	Mineral superphosphate, No. 1, 500 lbs. per acre....	33	9 7/8	2,022	52	2	2,010	35	12 7/9	2,021
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre....	43	11 6/8	2,941	65	30	2,460	45	28 8/9	2,888
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	35	5 1/8	2,373	43	8	3,210	36	1 8/9	2,466
12	Unmanured....	22	19 4/8	1,632	18	18	1,310	22	4 2/9	1,596
13	Bone, finely ground, 500 lbs. per acre....	31	26	2,023	45	30	1,890	33	11 8/9	2,008
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	35	10 5/8	2,237	57	12	2,470	37	25 8/9	2,263
15	Nitrate of soda, 200 lbs. per acre....	43	31 1/8	2,725	60		2,840	45	23 8/9	2,738
16	Muriate of potash, 150 lbs. per acre....	33	23	2,265	51	16	2,180	35	22 2/9	2,256
17	Sulphate of ammonia, 300 lbs. per acre....	41	30 3/8	3,165	56	16	2,740	43	17 4/9	3,118
18	Sulphate of iron, 60 lbs. per acre....	34	15 2/8	2,210	54	29	2,335	36	24 8/9	2,224
19	Common salt (Sodium chloride) 300 lbs. per acre....	33	16 6/8	2,025	53	18	2,300	35	24 4/9	2,056
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre....	31	7 2/8	2,137	49	4	2,010	33	6 8/9	2,123
21	Mineral superphosphate, No. 2, 500 lbs. per acre....	30	3 1/8	1,924	57	22	2,060	33	5 2/9	1,939

CORN PLOTS.

The experiments with the plots of Indian corn have been conducted with the object of obtaining the largest weight of well matured green fodder for the silo, and to have the corn so far advanced when cut, that the ears shall be in the late milk, or glazed condition. Each plot has been divided from the outset into two equal parts, on one of which—known as No. 1—one of the stronger growing and somewhat later ripening sorts has been tried, and on the other, marked No. 2, one of the earlier maturing varieties. During the first four years one of the dent varieties was tested under No. 1. The Mammoth Southern Sweet was tried in 1888, 1889 and 1890. In 1891 the Red Cob Ensilage was used, and in 1892, 1893, 1894, 1895, 1896 and 1897 a free growing flint variety, the Rural Thoroughbred White Flint, was tested. On the other half of the plot (No. 2) the Canada Yellow Flint was used in 1888, 1889 and 1890, the Thoroughbred White Flint in 1891, Pearce's Prolific in 1892, 1893 and 1894, and the Mammoth Eight Rowed Flint in 1895, 1896 and 1897. For the first four years the No. 1 series was planted in drills three feet apart, using about 24 pounds of seed to the acre and thinning the plants, when up, to 6 or 8 inches, and the No. 2 in hills 3 feet apart each way and 4 or 5 kernels in a hill. During the past six years both sorts have been grown in hills. The corn in both series of plots was planted in 1897 on 19th May, and cut 16th September. In most instances the yield of fodder on these plots during the past season has been below the average of past years.

With Indian corn the rotted manure has given in both plots a larger return this year than the fresh manure, but the average of ten years tests still shows the fresh manure in advance of the rotted in plot 1 by 1 ton 787 pounds per acre, while in plot 2 the advantage is with the rotted manure by 1,965 pounds per acre.

EXPERIMENTS WITH FERTILIZERS, ON PLOTS OF INDIAN CORN, 1/10TH ACRE EACH, CUT GREEN FOR ENSILAGE.

No. of Plot.	Fertilizers applied each year.	Average Yield for Nine Years.				10th Season, 1897.				Average Yield for Ten Years.			
		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder		½ Plot No. 1—Thoroughb'd White Flint, weight of green fodder		½ Plot No. 2—Mam. 8 rowed, weight of green fodder		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder	
		Per acre.		Per acre		Per acre.		Per acre		Per acre.		Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
1	Barn-yard manure, well rotted, 12 tons per acre ...	15	1,172	12	107	21	440	15	900	16	299	12	786
2	Barn-yard manure, fresh, 12 tons per acre.	17	1,739	11	1,175	14	1,210	9	1,640	17	1,086	11	821
3	Unmanured..	8	1,256	5	1,866	3	860	4	1,040	8	306	5	1,583
4	Mineral phosphate untreated, finely ground, 500 lbs. per acre in 1888—800 lbs. per acre each year since.	7	647	5	190	3	665	3	1,190	6	1,843	4	1,890
5	Mineral phosphate untreated, finely ground, 500 lbs. per acre in 1888—800 lbs. per acre each year since; nitrate of soda, 200 lbs. per acre.	11	467	8	1,074	6	540	8	1,610	10	1,474	8	1,128
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre; composted together, intimately mixed and allowed to heat for several days before using	16	1,095	11	1,293	15	810	10	1,500	16	866	11	1,114
7	Mineral phosphate untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	15	560	10	1,389	14	1,805	13	800	15	484	10	1,930

EXPERIMENTS WITH FERTILIZERS, ON PLOTS OF INDIAN CORN—*Concluded.*

No. of Plot.	Fertilizers applied each year.	Average Yield for Nine Years. ½ Plot No. 1—weight of green fodder. Per acre. Tons.	lbs.	Average Yield for Nine Years. ½ Plot No. 2—weight of green fodder. Per acre. Tons	lbs	10th Season, 1897. ½ Plot No. 1—Thoroughb'd White Flint, weight of green fodder. Per acre. Tons.	lbs.	10th Season, 1897. ½ Plot No. 2—Mam. 8 rowed, weight of green fodder. Per acre. Tons	lbs	Average Yield for Ten Years. ½ Plot No. 1—weight of green fodder. Per acre. Tons.	lbs.	Average Yield for Ten Years. ½ Plot No. 2—weight of green fodder. Per acre. Tons	lbs
8	Mineral phosphate untreated, finely ground, 500 lbs. ; wood ashes, unleached, 1,500 lbs. per acre....	11	1,747	8	982	11	700	10	380	11	1,642	8	1,322
9	Mineral superphosphate No. 1, 500 lbs. per acre...	10	1,947	8	206	8	1,010	8	300	10	1,453	8	215
10	Mineral superphosphate No. 1, 350 lbs. per acre ; nitrate of soda, 200 lbs. per acre..	13	1,762	10	1,040	10	960	9	1,380	13	1,082	10	874
11	Mineral superphosphate No. 1, 350 lbs. ; nitrate of soda, 200 lbs ; wood ashes, unleached, 1,500 lbs. per acre....	16	165	12	746	17	1,440	14	810	16	492	12	1,152
12	Unmanured....	11	291	9	368	8	1,370	7	....	10	1,799	8	1,931
13	Bone, finely ground, 500 lbs. per acre. ...	11	1,534	9	8	11	210	9	1,010	11	1,402	9	108
14	Bone, finely ground, 500 lbs. ; wood ashes, unleached, 1,500 lbs. per acre....	12	284	8	1,592	14	205	10	1,405	12	676	8	1,973
15	Nitrate of soda, 200 lbs. per acre....	13	303	10	132	9	1,540	8	700	12	1,627	9	1,789
16	Sulphate of ammonia, 300 lbs. per acre....	13	1,024	10	136	10	1,490	8	800	13	471	9	1,802
17	Mineral superphosphate No. 1, 600 lbs. ; muriate of potash, 200 lbs. ; sulphate of ammonia, 150 lbs. per acre....	13	3	9	703	14	600	12	1,250	13	263	9	1,358
18	Muriate of potash, 300 lbs. per acre....	9	618	5	1,992	8	1,310	6	300	9	487	6	23
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and '90 ; (muriate of potash, 200 lbs., substituted each year since) ; dried blood, 300 lbs. ; mineral superphosphate No. 1, 500 lbs. per acre..	11	1,244	7	1,800	12	660	7	1,400	11	1,386	7	1,760
20	Wood ashes, unleached, 1,900 lbs. per acre.	10	401	7	83	8	1,650	7	1,060	10	126	7	181
21	Bone, finely ground, 500 lbs. ; sulphate of ammonia, 200 lbs. ; muriate of potash, 200 lbs. per acre....	13	634	9	266	11	700	7	1,910	13	241	9	31

PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under so that the plant food they have taken from the soil may be returned to it. One-half of each one-tenth acre plot in the series has been devoted to the growth of mangels, and the other half to turnips. The preparation of the land has been the same for both these roots. It has been ploughed in the autumn after the crop is gathered, disc-harrowed or gang-ploughed once in the spring, harrowed with smoothing harrow once, then ridged, rolled and sown.

In 1889, the variety of mangel used was the Mammoth Long Red. In 1890, three varieties were sown : 15 rows of Mammoth Long Red, 6 of Mammoth Long Yellow, and 6 of Golden Intermediate on each plot. In 1891, each plot again had three varieties : 18 rows of Mammoth Long Red, 3 of Yellow Fleshed Tankard, and 6 of Golden Tankard. In 1892, 1893, 1894, 1895, 1896 and 1897 one variety only has been used, namely, the Mammoth Long Red. From 4 to 6 pounds of seed have been sown per acre, each year, in rows $2\frac{1}{2}$ feet apart. In 1897 the mangels were sown 5th May, came up 17th May, and were pulled 11th October.

Two varieties of turnips were sown on the half plots devoted to these roots in 1889: 25 rows of Carter's Prize Winner, and 2 rows of Carter's Queen of Swedes; and in 1890, a single variety, Carter's Elephant Swede. In 1891, six varieties were sown: 6 rows of Lord Derby Swede, 4 of New Giant King, 3 of Imperial Swede, 6 of Champion Swede, 4 of Purple Top Swede, and 4 of East Lothian Swede. In 1892, the Improved Purple Top Swede only was sown, in 1893 and 1894 the Prize Purple Top Swede, in 1895 the Imperial Swede, and in 1896 and 1897 the Prize Purple Top Swede. The land used for the turnips, which are usually sown later than the mangels, is allowed to stand after disc-harrowing or gang-ploughing, then cultivated once and ridged and rolled immediately before sowing. In 1897, the turnips were sown 10th June, came up 15th June, and were pulled 16th October. The crops of turnips have been larger during the past season on all the plots excepting 17 and 21 than the average of previous years, while in the case of the mangels all of the plots excepting 1, 2, 5, 6, 7 and 18 have given a smaller yield than the average of the past eight years. The rotted manure has averaged better results than the fresh manure with the mangels, but the turnips have given better results with the fresh manure.

EXPERIMENTS WITH FERTILIZERS ON ROOTS; PLOTS OF MANGELS AND TURNIPS $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Eight Years.		9th Season, 1897. Varieties.		Average Yield for Nine Years.	
				West Half Plot.	East Half Plot.		
		Mangels, Weight of Roots.	Turnips, Weight of Roots.	Mangels, Mammoth Long Red: Weight of Roots.	Turnips, Purple Top Swede: Weight of Roots.	Mangels, Weight of Roots.	Turnips, Weight of Roots.
		Per Acre.	Per Acre	Per Acre.	Per Acre.	Per Acre.	Per Acre.
		Tons. Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.
1	Barn-yard manure, well rotted, 20 tons per acre	22 800	13 1,285	27 1,180	24 1,020	22 1,953	14 1,700
2	Barn-yard manure, fresh, 20 tons p. ac.	21 1,594	14 864	25 1,030	23 140	22 420	15 784
3	Unmanured	9 933	7 422	7 1,260	9 1,860	9 525	7 1,026
4	Mineral phosphate, untreated, finely ground, 1,000 lbs. per acre	8 1,419	7 704	8 810	10 310	8 1,351	7 1,327
5	Mineral phosphate, untreated, finely ground, 1,000 lbs.; nitrate of soda, 250 lbs.; wood ashes, unleached, 1,000 lbs. per acre	13 632	8 1,244	16 870	13 1,350	13 1,325	9 367
6	Barn-yard manure, partly rotted and actively fermenting, 12 tons per acre; mineral phosphate, untreated, finely ground, 1,000 lbs per acre, composted together, intimately mixed and allowed to heat for several days before using	18 196	12 632	20 1,800	20 1,590	18 819	13 516
7	Mineral phosphate, untreated, finely ground, 1,000 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890, (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre	9 1,668	8 1,497	14 170	12 1,520	10 613	9 389
8	Mineral superphosphate, No. 1, 500 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890, (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre	14 1,628	11 1,271	11 480	15 280	14 834	12 50
9	Mineral superphosphate, No. 1, 500 lbs. per acre	9 1,594	8 1,558	7 370	12 740	9 1,014	9 356

EXPERIMENTS WITH FERTILIZERS ON ROOTS; PLOTS OF MANGELS AND TURNIPS—*Concluded.*

No. of Plot.	Fertilizers applied each Year.	Average Yield for Eight Years. Mangels, Weight of Roots. Per Acre.		Average Yield for Eight Years. Turnips, Weight of Roots. Per Acre.		9th Season, 1897. Varieties. West Half Plot. Mangels, Mammoth Long Red: Weight of Roots. Per Acre.		9th Season, 1897. Varieties. East Half Plot. Turnips, PurpleTop Swede: Weight of Roots. Per Acre.		Average Yield for Nine Years. Mangels, Weight of Roots. Per Acre.		Average Yield for Nine Years. Turnips, Weight of Roots. Per Acre.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
10	Nitrate of soda, 300 lbs. per acre....	14	1,209	8	1,305	14	470	12	590	14	1,127	9	114
11	Sulphate of ammonia, 300 lbs. per ac.	11	1,181	10	62	11	620	14	1,950	11	1,119	10	1,161
12	Unmanured	7	1,377	6	1,968	4	1,470	8	1,860	7	721	7	400
13	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,000 lbs. per acre	10	1,041	8	165	9	840	12	300	10	796	8	1,069
14	Wood ashes, unleached, 2,000 lbs. p.ac	11	1,096	7	1,916	8	1,680	8	420	11	494	7	1,972
15	Common salt (Sodium chloride), 400 lbs. per acre....................	10	95	7	1,011	8	1,790	7	1,750	9	1,839	7	1,093
16	Mineral superphosphate, No. 1, 500 lbs.; nitrate of soda, 200 lbs. per ac.	13	1,589	10	1,226	12	670	11	950	13	1,265	10	1,418
17	Mineral superphosphate, No. 1, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	12	1,415	9	1,243	12	120	8	670	12	1,271	9	957
18	Mineral superphosphate, No. 1, 500 lbs.; muriate of potash, 200 lbs. p.ac.	12	657	10	1,033	12	1,550	10	1,410	12	756	10	1,075
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890 (muriate of potash, 200 lbs., substituted each year since); dried blood, 250 lbs.; mineral superphosphate, No. 1, 1,500 lbs. per acre...	14	493	11	816	12	1,190	13	1,290	14	126	11	1,313
20	Wood ashes, unleached, 1,500 lbs.; common salt (Sodium chloride), 300 lbs. per acre.....................	14	1,440	10	1,052	13	690	10	1,470	14	1,134	10	1,098
21	Mineral superphosphate, No. 2, 500 lbs. per acre......................	15	898	10	1,808	13	910	10	1,500	15	455	10	1,774

CARROT PLOTS.

Carrots have been sown on alternate halves of the oat plots for the past seven years, for the purpose of cleaning the land from weeds. This work was begun in 1891, and the plots have been sown each year with the variety known as the Improved Short White. In 1897, carrots occupied the east half of the plots. The seed was sown 5th May, came up 18th May, and the roots were pulled 18th October. The crop this year on plots 1, 2, 6, 7, 8, 9, 10, 11 were above the average of the preceding years. The other plots were all below the average.

EXPERIMENTS WITH FERTILIZERS ON HALF PLOTS ($\frac{1}{20}$TH ACRE) OF CARROTS (IMPROVED SHORT WHITE), AFTER OATS.

No. of Plot.	Fertilizers applied each Year.	Average Yield for six years. Weight of roots per acre.		7th Season, 1897. Improved Short White. Weight of roots per acre.		Average Yield for seven years. Weight of roots per acre.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre.......... ...	18	1,875	25	990	19	1,749
2	Barn-yard manure, fresh, 15 tons per acre..................	20	1,003	24	120	21	20
3	Unmanured	12	1,990	10	1,870	12	1,401
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	13	511	9	1,890	12	1,565
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre	15	1,633	12	60	15	551
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed, and allowed to heat for several days before using	19	61	19	330	19	99
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	15	305	18	1,470	15	1,329
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	12	345	14	370	12	920
9	Mineral superphosphate, No. 1, 500 lbs. per acre	9	1,798	10	360	9	1,878
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre..	12	81	13	1,570	12	579
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.: wood ashes, unleached, 1,500 lbs. per acre........ .	15	1,160	15	1,840	15	1,257
12	Unmanured	11	541	*4	790	10	577
13	Bone, finely ground, 500 lbs. per acre.................... ..	12	183	*7	800	11	843
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre...	17	1,630	*9	850	16	1,233
15	Nitrate of soda, 200 lbs. per acre................	15	359	13	1,240	14	1,913
16	Muriate of potash, 150 lbs. per acre	16	1,093	15	190	16	678
17	Sulphate of ammonia, 300 lbs. per acre.....................	11	331	9	1,530	10	1,931
18	Sulphate of iron, 60 lbs. per acre...............	12	173	10	1,480	11	1,788
19	Common salt (Sodium chloride), 300 lbs. per acre	14	68	11	1,340	13	1,393
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre..	14	738	9	1,060	13	1,355
21	Mineral superphosphate, No. 2, 500 lbs. per acre	11	1,525	8	1,670	11	689

* Plots 12, 13 and 14 were on a piece of rising ground on light soil and were injured by wind; plot 12 suffered more than the others.

POTATO PLOTS.

The alternate halves of the wheat and barley plots which were occupied by carrots and sugar beets in 1891, 1892 and 1893 were planted with potatoes in 1894, 1895, 1896 and 1897. These were planted in rows 2½ feet apart, with the sets about one foot apart in the rows.

Those grown in 1897 after wheat were planted 14th May, came up 9th June and were dug 10th October. On each of these plots there were nine rows each of Empire State, Early Sunrise and Clarke's No. 1.

Those grown after barley were planted 14th May, came up 9th June, and were dug 29th September. On these plots there were nine rows each of Vanier, Lee's Favorite and Northern Spy. In the tables following, the yield of each variety for each plot is given, also the crop, in bushels, per acre.

EXPERIMENTS WITH FERTILIZERS ON HALF PLOTS ($\frac{1}{20}$TH ACRE) OF POTATOES AFTER WHEAT.

No. of Plot.	Fertilizers applied each Year.	West Half of Plots.				
		Yield of 9 rows Empire State.	Yield of 9 rows Early Sunrise.	Yield of 9 rows Clarke's No. 1.	Total Yield per Acre.	
		Lbs.	Lbs	Lbs.	Bush.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year since....	196½	251	285	244	10
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year since..........	207½	258	280	248	30
3	Unmanured....................................	103½	103½	100	102	20
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre..	108½	108½	73½	96	50
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre..............................	116½	113½	110½	113	30
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using..........	194½	223½	229½	215	50
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre .	153	178	160½	163	50
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre..........................	124½	127	131	127	30
9	Mineral superphosphate, No. 1, 500 lbs. per acre..............	112	74½	127	104	30
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre..	143½	137½	155	145	20
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre.............	184	222½	223	209	50
12	Unmanured....................................	120½	86½	89	98	40
13	Bone, finely ground, 500 lbs. per acre.........................	133½	103	90	108	50
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre..	162½	153	136	150	30
15	Nitrate of soda, 200 lbs. per acre..........................	113½	108½	111½	111	10
16	Muriate of potash, 150 lbs. per acre	136½	135	114½	128	40
17	Sulphate of ammonia, 300 lbs. per acre......................	109	84½	82	81	50
18	Sulphate of iron, 60 lbs. per acre..........................	117	105½	92½	105	00
19	Common salt (Sodium chloride), 300 lbs. per acre..............	127½	103	72½	101	00
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre...	152½	98	88	112	50
21	Unmanured in 1889, mineral superphosphate, No. 2, 500 lbs. per acre each year since.....................................	135½	117½	103½	118	50

EXPERIMENTS WITH FERTILIZERS ON HALF PLOTS ([illegible]TH ACRE) OF POTATOES AFTER BARLEY.

No. of Plot.	Fertilizers applied each Year.	East Half of Plots.				
		Yield of 9 rows Vanier.	Yield of 9 rows Lee's Favourite.	Yield of 9 rows Northern Spy.	Total Yield per Acre.	
		Lbs.	Lbs.	Lbs.	Bush.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre.	317	230	329	292	
2	Barn-yard manure, fresh, 15 tons per acre........	273½	217	293½	261	20
3	Unmanured..........	134½	95	141	123	30
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre.	84½	73	154	103	50
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre..................	112½	60½	143½	105	30
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using........................	235½	142½	266	214	40
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre......	179	94	203½	158	50
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.........	195¼	93	202½	163	31
9	Mineral superphosphate, No. 1, 500 lbs. per acre... . .	162	124	183½	156	30
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre..............................	178½	137	202	172	30
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	215	130½	198½	181	20
12	Unmanured..	121½	59½	104½	95	10
13	Bone, finely ground, 500 lbs. per acre..................	122½	71½	154½	116	10
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre....................	232½	122½	233½	196	10
15	Nitrate of soda, 200 lbs. per acre	96	72½	134½	101	
16	Muriate of potash, 150 lbs. per acre...................	147	79	142½	122	50
17	Sulphate of ammonia, 300 lbs. per acre................	98	74	162	111	20
18	Sulphate of iron, 60 lbs. per acre......................	150	88½	150½	129	40
19	Common salt (Sodium chloride), 300 lbs. per acre	133½	63	121	105	50
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre.....	142½	76½	191½	136	50
21	Mineral superphosphate, No. 2, 500 lbs. per acre.......	154½	114½	195	154	40

In the following table particulars are given of the crops of potatoes obtained each year from 1894 to 1897, inclusive, from each of the plots devoted to experiments with fertilizers, also the average results of these tests for four years. It will be seen that plot 1, to which well rotted barn-yard manure has been applied, has given the best results in the plots after barley, while in those after wheat plot 2 on which fresh manure was used, has a very slight advantage. None of the artificial fertilizers or mixtures of these fertilizers have given results as good as those obtained from barn-yard manure. Of the single fertilizers tried, the best crops have been had from the Mineral Superphosphate of lime, and the next best from Muriate of Potash.

TABLE showing Crops of Potatoes obtained during four years from Fertilized Plots.

No. of Plot.	1894.		1895.		1896.		1897.		Average for four years.	
	After Wheat.	After Barley.	After Wheat.	After Barley.	After Wheat.	After Barley.	After Wheat.	After Barley.	After Wheat.	After Barley.
	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.
Plot No. 1....	264 50	247 20	306 20	241 40	302 50	253 50	244 10	292 ..	279 32	258 42
" " 2....	234 20	265 40	366 ..	249 50	270 10	233 40	248 30	261 20	279 45	252 37
" " 3....	141 10	123 50	144 40	101 30	90 ..	99 50	102 20	123 30	119 32	112 10
" " 4....	142 50	128 10	127 50	93 40	84 40	98 10	96 50	103 50	113 2	105 57
" " 5....	150 ..	104 40	157 40	98 30	94 ..	98 50	113 30	105 30	128 47	101 52
" " 6....	218 10	180 10	317 20	243 50	256 20	196 40	215 50	214 40	251 55	208 40
" " 7....	172 ..	156 30	213 ..	151 20	165 ..	135 20	163 50	158 50	178 27	150 30
" " 8....	155 50	162 30	174 20	150 40	133 50	128 20	127 30	163 31	147 52	151 15
" " 9....	178 50	197 10	169 10	152 10	130 ..	147 40	104 30	156 30	145 37	163 22
" " 10....	174 50	172 50	169 30	123 40	119 50	99 50	145 20	172 30	152 22	142 12
" " 11....	175 20	232 40	274 30	163 ..	182 30	193 30	209 50	181 20	210 32	192 37
" " 12....	102 30	118 30	119 50	71 20	77 40	80 ..	98 40	95 10	99 40	91 15
" " 13....	109 10	97 50	102 50	82 30	85 50	64 ..	108 50	116 10	101 40	90 7
" " 14....	180 40	172 ..	204 20	181 20	176 ..	115 ..	150 30	196 10	177 52	166 7
" " 15....	174 ..	114 40	99 50	81 20	105 30	88 50	111 10	101 ..	122 37	96 27
" " 16....	146 20	141 40	148 ..	133 ..	131 40	119 10	128 40	122 50	138 40	129 10
" " 17....	98 50	93 10	95 50	94 ..	69 50	54 50	81 50	111 20	86 35	88 20
" " 18....	89 40	97 40	103 20	97 10	69 10	71 50	105 ..	129 40	91 47	99 5
" " 19....	64 10	156 ..	73 ..	59 ..	52 50	109 ..	101 ..	105 50	72 45	107 27
" " 20....	85 ..	171 10	60 40	49 40	83 10	107 ..	112 50	136 50	85 25	116 10
" " 21 ...	105 ..	155 10	90 20	119 10	95 50	119 16	118 50	154 40	102 30	137 4

The varieties which have been tested during the four years named and the weights obtained of each sort in pounds per row are here given. These rows have in each case run through the whole series of fertilized plots, and as the conditions under which the different varieties have been grown may be considered as very similar, if not identical, the results may fairly be regarded as indicating the relative productiveness of the different sorts under trial.

Name of Variety.	1894.	1895.	1896.	1897.	Average.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Northern Spy	......	......	......	434	434
Queen of the Valley	......	462	358	......	410
Vanier	......	......	......	387	387
Early Sunrise	......	407	367	321	365
Thorburn	357	329	351	......	346
Wonder of the World	406	344	247	......	332
Empire State	......	......	......	328	328
Beauty of Hebron	406	257	308	......	323
Daisy	......	376	268	......	322
Early Rose	235	426	294	......	318
Clarke's No. 1	......	......	......	317	317
Lee's Favourite	333	284	295	247	290
Burpee's Extra Early	......	......	276	......	276
May Queen Early	......	269	259	......	264

DISTRIBUTION OF SEED GRAIN.

A further distribution of seed grain was made in the spring of 1897, chiefly of samples of the most promising sorts which had been grown at the several experimental farms. These have been sent out to farmers on application, one sample only to each applicant, with the object of placing within their reach pure samples and true to name of the best and most productive sorts in cultivation. By the careful handling of these samples the farmer can soon obtain sufficient seed for a large area and may thus be provided with the best sorts without any further cost than that of his own labour. The appreciation of this part of the experimental farm work is shown by the increasing demand for samples.

Preparations have been made for another distribution in 1898 which will consist as heretofore of promising sorts of oats, barley, wheat, pease, Indian corn and potatoes. The several branch farms will also again distribute samples to farmers residing in the provinces and territories where these farms have been established.

The samples sent out from the Central Experimental Farm at Ottawa during the early months of 1897 were distributed as follows:—

Kind of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	North-west Territories.	British Columbia.
Oats	838	1,977	1,263	6,087	3,686	618	328	187
Barley	332	1,016	414	3,019	1,418	206	136	95
Wheat	460	926	625	2,454	1,781	314	178	87
Pease	172	457	288	920	1,223	140	117	56
Indian Corn	80	336	189	648	808	58	28	18
Potatoes	137	326	201	1,316	996	210	105	99
Total number of samples sent	2,019	5,038	2,980	14,444	9,912	1,546	892	542
Number of applicants supplied	2,016	5,035	2,978	14,416	9,906	1,536	890	529

Total number of samples distributed, 37,373. Number of applicants supplied, 37,306.

The following list shows the number of 3-pound packages of the different varieties which have been distributed:

Oats.		Barley, Six-rowed.	
Banner	2,740	Odessa	2,112
Abundance	2,571	Trooper	868
Wallis	1,843	Mensury	547
Bavarian	1,806	Royal	235
Improved Ligowo	1,198	Vanguard	163
Early Gothland	1,089		
Golden Giant	904		
American Beauty	578		
Golden Beauty	434		
Columbus	348		
Joanette	284		
White Schonen	281	Two-rowed.	
Abyssinia	232		
Holstein Prolific	230	Canadian Thorpe	1,009
Hazlett's Seizure	194	French Chevalier	646
Flying Scotchman	98	Sidney	514
Early Archangel	96	Duckbill	495
Mennonite	58	Newton	47
Total	14,984	Total	6,636

LIST of the number of 3-pound packages of the different varieties distributed—*Concluded.*

PEASE.		**WHEAT—*Continued.***	
Prussian Blue	1,798	Herisson Bearded	287
Daniel O'Rourke	640	Crown	238
Large White Marrowfat	462	Huron	206
Mummy	327	White Russian	206
Black-eyed Marrowfat	89	Ladoga	201
Canadian Beauty	57	Rio Grande	180
		Advance	177
Total	3,373	Alpha	99
		Stanley	71
INDIAN CORN.		Total	6,825
Champion White Pearl	650	**POTATOES.**	
White Cap Yellow Dent	588		
Compton's Early	226	Northern Spy	505
90 Day Corn	223	Empire State	471
King of the Earliest	178	Clarke's No. 1	304
Longfellow	124	Lee's Favourite	250
Mammoth Early Flint	92	Early Sunrise	241
Angel of Midnight	84	Queen of the Valley	234
		Daisy	197
Total	2,165	Burpee's Extra Early	194
		Vanier	186
WHEAT.		Pearce's Extra Early	180
		May Queen Early	140
		Wonder of the World	129
Red Fife	1,184	Beauty of Hebron	123
White Fife	999	Chicago Market	121
Wellman's Fife	982	Early White Surprise	49
White Connell	685	Thorburn	46
Preston	597	Dakota Red	20
Percy	376		
Red Fern	327	Total	3,390

SPECIAL DISTRIBUTION OF CROSS-BRED CEREALS.

Some of the more promising of the cross-bred and hybrid cereals were available this year in sufficient quantity to be included to some extent in the general distribution of 3-pound bags. There were, however, others of which only a small quantity could be had. These were sent out in 1 pound bags to farmers in the several provinces, as follows :—

	Prince Edward Island.	New Brunswick.	Nova Scotia.	Quebec.	Ontario.	Manitoba.	North-west Territories.	British Columbia.
Cross-bred wheats	8	20	14	63	80	21	19	1
Cross-bred pease	52	97	127	216	267	23	24	18
Total	60	117	141	279	347	44	43	19

Making 1,050 samples in all, which, added to the distribution of the Central Farm, makes the total number of samples sent out 38,423.

Testing the vitality and germinating power of seed grain and other agricultural seeds at the Central Experimental Farm, Ottawa.

Distribution of samples of seed grain at the Central Experimental Farm. Getting ready for the mail.

DISTRIBUTION OF SAMPLES FROM BRANCH EXPERIMENTAL FARMS.

Samples of 3 pounds each were also distributed from the branch experimental farms as follows :—

Experimental Farm, Nappan, N.S.

Oats	345
Barley	183
Wheat	91
Pease	83
Rye	6
Potatoes	302
	1,010
No. of applicants supplied	543

Experimental Farm, Brandon, Man.

Grain of all sorts	357
Potatoes	210
	567

Experimental Farm, Indian Head, N.W.T.

Oats	401
Barley	259
Wheat	253
Pease	233
Rye	18
Flax	2
Potatoes	372
	1,538

Experimental Farm, Agassiz, B.C.

Oats	57
Barley	29
Wheat	51
Pease	49
Potatoes	68
	254

This makes a total of 3,369 samples sent out by the branch experimental farms which, added to the number distributed by the Central Farm, makes a total of 41,792. Much interest is taken by farmers generally in this branch of the work, and by this means some of the better varieties are rapidly finding their way into general cultivation.

TESTS OF THE VITALITY OF GRAIN AND OTHER SEEDS FOR 1897.

The number of samples of seed grain and other seeds which were tested for their germinating power during the season of 1897 was 2,174. The following figures show the variations in the average vitality of the more important cereals during the past five years :—

	1893.	1894.	1895.	1896.	1897.	Average for the five Years.
Wheat	81·8	90·5	88	87·7	83·5	86·3
Barley	84·9	89	85·7	90·1	90	87·9
Oats	93	95·5	93·3	89·8	93·6	93

Many of the samples sent for test are much below the average in vitality, hence the figures given above do not fairly represent the vitality of grain of average quality grown in different parts of the Dominion. One of the chief objects in continuing these tests from year to year, is to give farmers the opportunity of having any samples which may be of doubtful vitality, through injury in harvesting or storing, thoroughly tested, so that their value for seed purposes may be known. Samples may be sent free through the mail, and this work is done and reported on free of charge. Samples can usually be reported on within a fortnight after they are received.

RESULTS of Tests of Seeds for vitality, 1896-97.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	482	100·0	....	77·5	6·0	83·5
Barley	465	100·0	17·0	81·8	8·2	90·0
Oats	662	100·0	....	88·7	4·9	93·6
Rye	2	75·0	67·0	64·5	6·5	71·0
Pease	241	100·0	....	....	....	77·2
Corn	23	100·0	28·0	....	....	85·8
Clover	13	87·0	26·0	....	....	72·6
Grass	10	98·0	17·0	....	....	74·9
Turnips	13	84·0	28·0	....	....	72·4
Carrots	5	68·0	23·0	....	....	42·0
Mangels	4	78·0	18·0	....	....	43·0
Beets	10	98·0	42·0	....	....	76·6
Sunflowers	3	98·0	92·0	....	....	95·3
Lettuce	17	95·0	2·0	....	....	58·0
Onions	18	100·0	42·0	....	....	68·1
Leeks	6	75·0	27·0	....	....	51·5
Tomatoes	20	90·0	16·0	....	....	67·0
Cabbage	29	98·0	33·0	....	....	69·8
Brussel Sprouts	2	79·0	43·0	....	....	61·0
Cauliflowers	4	83·0	50·0	....	....	69·2
Radish	13	80·0	30·0	....	....	48·4
Spinach	4	55·0	31·0	....	....	43·5
Cucumbers	11	82·0	34·0	....	....	62·5
Sweet Peas	11	100·0	48·0	....	....	83·0
Musk Melon	7	96·0	24·0	....	....	66·5
Water Melon	9	82·0	....	....	....	50·0
Squash	11	100·0	4·0	....	....	66·9
Peppers	7	59·0	8·0	....	....	27·7
Celery	6	77·0	28·0	....	....	55·0
Chervil	2	28·0	9·0	....	....	18·5
Citron	2	84·0	32·0	....	....	58·0
Mustard	3	93·0	84·0	....	....	89·6
Cress	3	94·0	79·0	....	....	88·0
Parsley	4	49·0	7·0	....	....	29·2
Tobacco	3	71·0	55·0	....	....	65·0
Asparagus	6	79·0	12·0	....	....	45·8
Flax Seed	3	84·0	58·0	....	....	72·3
Buckwheat	2	96·0	93·0	....	....	94·5
Sage	2	24·0	10·0	....	....	17·0
Summer Savory	2	22·0	13·0	....	....	17·5
Thyme	2	10·0	7·0	....	....	8·5
Tares	1	86·0	86·0	....	....	86·0
Canary Seed	1	31·0	31·0	....	....	31·0
Horse Beans	1	98·0	98·0	....	....	98·0
Sweet Marjoram	1	19·0	19·0	....	....	19·0
Endive	1	30·0	30·0	....	....	30·0
Kale	1	81·0	81·0	....	....	81·0
Salsify	1	49·0	49·0	....	....	49·0
Parsnips	3	24·0	5·0	....	....	17·3
Poppy	3	89·0	53·0	....	....	71·0
Candytuft	3	97·0	59·0	....	....	84·0
Mignonette	2	36·0	7·0	....	....	21·5
Chrysanthemum	1	43·0	43·0	....	....	43·0
Salpiglossis	1	43·0	43·0	....	....	43·0
Zinnia	1	88·0	88·0	....	....	88·0
Stocks	1	1·0	1·0	....	....	1·0
Portulacca	1	8·0	8·0	....	....	8·0
Hesperis	1	13·0	13·0	....	....	13·0
Larkspur	1	80·0	80·0	....	....	80·0
Pansy	1	71·0	71·0	....	....	71·0
Pink	1	59·0	59·0	....	....	59·0
Sweet William	1	75·0	75·0	....	....	75·0
Coriander	1	36·0	36·0	....	....	36·0
Berberis	1	3·0	3·0	....	....	3·0
Mountain Ash	1	....	....	....	....	....
Caragana	1	86·0	86·0	....	....	86·0
Total number of samples tested, highest and lowest percentage.	2,174	100·0	00·0	....	....	....

TABLE showing the number of Grain Tests for each Province.

ONTARIO.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	140	100·0	0·0	72·9	6·9	79·8
Barley	176	100·0	60·0	78·5	10·0	88·5
Oats	190	100·0	0·0	93·6	3·5	97·1

QUEBEC.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	61	100·0	16·0	84·7	4·5	89·2
Barley	51	100·0	56·0	84·3	6·7	91·0
Oats	54	100·0	79·0	92·2	4·2	96·4

MANITOBA.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	57	100·0	36·0	82·5	4·9	87·4
Barley	43	98·0	17·0	75·3	9·6	84·9
Oats	103	100·0	39·0	85·4	7·1	92·5

NORTH-WEST TERRITORIES.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	83	99·0	23·0	77·5	6·7	84·2
Barley	66	100·0	64·0	83·6	8·6	92·2
Oats	104	100·0	22·0	80·0	8·2	88·2

NOVA SCOTIA.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	74	99·0	25·0	71·7	6·8	78·5
Barley	65	100·0	69·0	86·1	5·9	92·0
Oats	100	100·0	33·0	87·2	3·8	91·0

NEW BRUNSWICK.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	21	100·0	66·0	88·3	3·8	92·1
Barley	15	100·0	49·0	78·8	7·5	86·3
Oats	31	100·0	77·0	90·5	3·7	94·2

PRINCE EDWARD ISLAND.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	9	93·0	66·0	75·9	6·3	82·2
Barley	6	99·0	67·0	74·5	14·3	88·8
Oats	15	100·0	78·0	93·5	2·4	95·9

BRITISH COLUMBIA.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	37	99·0	71·0	81·2	5·1	86·3
Barley	43	100·0	72·0	91·6	3·9	95·5
Oats	65	100·0	68·0	91·5	3·4	94·9

METEOROLOGICAL OBSERVATIONS.

TABLE of Meteorological Observations taken at the Central Experimental Farm, Ottawa, 1897; maximum, minimum and mean temperature for each month, with date of occurrence, also rainfall and snowfall.

Months.	Maximum.	Date.	Minimum.	Date.	Mean.	Rain-fall.	Snow-fall.	Number of days Precipitation.
	°		°		°	in.	in.	
January	45·5	3rd	—25·7	25th	12·2	0·38	15·50	16
February	40·0	21st	—12·0	26th	15·7	0·35	15·75	13
March	49·9	30th	—18·0	1st	23·4	1·53	28·50	16
April	77·0	23rd	13·2	20th	40·8	1·72	1·00	13
May	76·0	9th	33·5	8th	53·0	3·29	....	14
June	84·0	23rd	36·8	2nd	60·7	3·01	....	16
July	97·2	8th	55·2	27th	71·2	5·19	....	15
August	85·2	8th	42·2	24th	62·6	3·40	....	14
September	92·0	9th	32·3	28th	59·4	0·45	....	6
October	85·0	15th	22·2	10th	48·2	0·69	....	8
November	54·0	26th	6·8	30th	29·8	2·19	5·75	18
December	44·9	11th	—15·6	25th	17·3	1·98	22·50	16
						24·18	89·00	165

Rain or snow fell on 165 days during the 12 months.
Heaviest rainfall in 24 hours, 1·18 inches on July 12th.
Heaviest snowfall in 24 hours, 7 inches on March 25th.
It will be seen the highest temperature during the 12 months was 97°·2, on July 8th.
The lowest temperature during the 12 months was —25°·7, on January 25th.
During the growing season rain fell on 13 days in April, 14 days in May, 16 days in June, 15 days in July, and 14 days in August.
September shows the lowest number of days on which rain fell, viz., 6.
Rain or snow fell on 18 days during November.

WILLIAM T. ELLIS, *Observer.*

RESULTS OF EXPERIMENTS IN THE CROSS-FERTILIZING OF PLANTS, SHRUBS AND TREES.*

In the spring of 1868 the writer began a series of experiments in cross-fertilizing and hybridizing which have been continued at intervals ever since.** This work has included experiments with varieties of the gooseberry, red and white currant, black currant, raspberry, blackberry, grape, apple, pear, plum, cherry and peach; also with different sorts of wheat, barley, oats, pease and rye, and with several species of wild flowers and ornamental shrubs.

THE GOOSEBERRY AND CURRANT.

The first crosses attempted in 1868 were with the gooseberry. These were made with the object of improving the size and quality of what are known as the American gooseberries, by introducing strains of some of the best English sorts, and at the same time to obtain varieties free from the gooseberry, mildew, *Sphærotheca mors-uvæ*, which has in the past affected nearly all the English gooseberries grown here, so badly both in foliage and fruit as to discourage their culti-

* Read before the Botanical Section of the British Association for the Advancement of Science at Toronto, Ont., August, 1897.

** The term "cross-bred" is used when referring to crosses produced between different varieties of the same species, and the word "hybrid," when referring to forms produced by crossing plants which are recognized as distinct species.

vation. Those which are known as American or native sorts are believed to have resulted from crosses between the wild species and European forms, and are noted for their hardiness, productiveness, and freedom from mildew. Several hundred seedlings resulted from these efforts, some of which are still in cultivation. Two of them—one named Pearl (a cross between Downing and Aston's Seedling, or Broom Girl) and Red Jacket (a cross between Houghton and Warrington)—are both popular sorts, on account of their size, productiveness, and freedom from mildew, and are now extensively grown both in Canada and the United States. Among the early experiments some trials were made with the wild sorts—the small, smooth gooseberry, *Ribes oxyacanthoides*, and the prickly gooseberry, *Ribes Cynosbati*. No success attended the efforts with the former; but among the crosses obtained on the prickly gooseberry *R. Cynosbati* with Warrington were several interesting sorts, one of which was quite smooth, another sparingly hairy, and a third somewhat more hairy. This latter is still under cultivation at the Central Experimental Farm at Ottawa. In growth and habit the bushes resemble the female parent, but the fruit is considerably larger and much improved in quality, and the berries when ripe are tinged with red. Efforts were also made during these early years to cross the black, red and white currants with the gooseberry, but without success. After five or six years the new seedlings had increased to such an extent that their number was embarrassing, and no more work was undertaken on this line until 1890, after the establishment of the Canadian Experimental Farms, when a larger field for such work was opened. On my arrival from London, Ontario, at Ottawa, in 1887, all the surviving seedlings of all sorts of any promise—more than 800 in all—were taken to the Central Experimental Farm, and since then, with the help of assistants, many new forms have been produced. Among others, hybrids have been obtained between the cultivated black currant, *Ribes nigrum*, and a cultivated variety of the gooseberry, *Ribes Grossularia*; also between the black currant and white currant, a variety of *Ribes rubrum*. In each instance the black currant was chosen as the female. Three of the hybrids between the black currant and the white currant, and twenty-eight of those between the black currant and gooseberry, are still under trial. There are in this instance some well marked points of difference between the female and the male, and the hybrids, in many respects, are intermediate in their character. The branches of the black currant are without thorns, whereas those of the gooseberry are thorny; the hybrids have the branches thornless as in the female.


Fig. 1.—Leaf of Black currant.

The leaves of the black currant (Fig. 1) are large, three lobed, with the points of intersection between the lobes slightly notched, and the margins are serrated; the teeth coarse, somewhat irregular and pointed. (See figure.) The leaves are also supplied with a large number of oil cells, so that when bruised they exhale a strong and characteristic odour. The leaf stalks are very slightly hairy towards the base.

In the gooseberry the points of intersection between the lobes of the leaves are deeply notched (Fig. 2), and the marginal serrations are more irregular and rounded, with short, blunt points.

The leaves when bruised are odourless, and the leaf stalks are shorter and more decidedly hairy with the hairs extending further up the stalk.

In the hybrids the leaves are intermediate in form (Fig. 3), and almost as deeply cleft at the junction of the lobes as are those of the gooseberry. The serrations are also of an intermediate character, being less pointed than in the black currant and less rounded than in the gooseberry. The leaves of most of the hybrids have no odour when bruised, except in two instances where the black currant odour is faintly perceptible. The leaf stalks are more hairy than those of the black currant, but less hairy than those of the gooseberry.

Fig. 2.—Leaf of Gooseberry.

Fig. 3.—Leaf of Hybrid : Black currant with Gooseberry.

Fig. 4.—Flowers of Black currant.

The flowers of the black currant are borne on long bunches of seven to twelve (See figure 4), whereas in the gooseberry they are usually in pairs and occasionally there are three in a cluster. (Fig. 5.) In the hybrids they are borne in clusters of from four to seven. (Fig. 6.) In the structure of the pistil of the flower there is also a notable difference. In the black currant the pistil is single, smooth throughout, and somewhat thickened and robust towards the tip, which is flat and blunt (See figure 7*b*.) In the gooseberry it is longer and divided to the base, both branches being slender and very hairy for nearly half their length, the slender divisions diverging towards the tip. (See figure 7*c*.) In the hybrids the pistil is single for about half its length or more, but divided towards the tip, and the divisions divergent. (See figure 7*a*.) There are also differences in the time of blooming. The flowers of the gooseberry are open some days before those of the black currant ; while those of the hybrids are intermediate in that respect.

Fig. 5.—Flowers of Gooseberry.

Fig. 6.—Flowers of Hybrid.

All the hybrids have flowered freely every season for several years past, and although no imperfection can be detected in the floral organs, no fruit could be found on any of them until last year, when two berries were found on one bush and one on another. These were borne singly, like the gooseberry, and were about the size of a large black currant, but of a dull reddish colour. The seeds these contained were carefully saved and sown, but none of them have yet germinated. This season only one specimen of fruit was found and this dropped before it was fully matured. With the view of inducing the fruit to set more freely, clusters of the flowers have been artificially fertilized with pollen from adjacent flowers on the same bush, also from flowers of the black currant and the gooseberry; but none of these experiments have been successful.

(a.) (b.) (c.)

Fig. 7.

a.—Pistil of hybrid enlarged to three diameters.
b.— " black currant " " "
c.— " gooseberry " " "

The several differences and resemblances noticed seem to establish the true hybrid character of the progeny, a point further confirmed by the fact that the gooseberry and white currant characteristics in these hybrids are recognized by insects and parsitic plants The gooseberry saw-fly (*Nematus ribesii*), which is not known to touch the foliage of the black currant, consumes, with great avidity, the leaves of the gooseberry and white currant; it also feeds freely on the hybrids, which, although raised from seed of the black currant, are thus recognized by this insect as partaking of the nature of the male parent. The gooseberry mildew, also *Sphaerotheca mors-uvae*, B. & C., which is not known to affect the black currant, attacks the hybrids freely, showing that the gooseberry characteristics which they possess are recognized also by this fungus enemy of the gooseberry.

Another group of experiments with shrubs in this genus has been the crossing of the cultivated black currant, *Ribes nigrum*, with the wild black currant of the western plains, *Ribes floridum.* From this cross a number of seedlings have been produced, partaking more or less of the characteristics of both parents, some of which promise to be worthy of cultivation for their fruit. During the past season a number of additional crosses in this genus have been successfully made, from which some further results of interest are looked for.

The Grape.

From 1868 to 1875 a large number of hybrids were produced by fertilizing prepared flowers of the native or improved native grapes with pollen of the European varieties. During this time more than 3,000 grape flowers were operated on, from which about 400 seedlings were obtained. No winter protection was given to any of these young seedlings, and a large proportion of the new introductions from year to year perished during the winter following. Many others were discarded for the reason that they produced staminate flowers only, and some on account of lack of vigour in the vines or the poor quality of the fruit. Only a few of these seedlings have survived to the present time, and of these two only are specially worthy of mention, viz., Emerald and Kensington. These are both yellowish green grapes and Kensington is specially productive.

In the case of the latter, the female was the Clinton, which is an improved form of the native frost grape, *Vitis cordifolia;* the male was Buckland's Sweetwater, a variety of *Vitis vinifera*, a large greenish white grape grown under glass. The Clinton is a vigorous grower, and very hardy, and in fruiting produces a bunch which is small to medium in size, long, narrow and very compact, somewhat lightly shouldered. The berry is small, round, and black and quite acid. The Buckland's Sweetwater is a less vigorous grower, is tender; the berries are large, pale yellowish green and oval in form; while the bunch is large and loose. The resulting hybrid resembles the Clinton in vigour of growth and hardiness of vine, also in the character of the foliage; the fruit, however, is of a pale yellowish green colour, the berries are oval, the bunch large and shouldered and moderately loose. The fruit is intermediate in size and quality, between the parents. In the fruit of the Clinton the seeds are short and plump, whereas in that of the Buckland's Sweetwater they are longer and less plump; in the hybrid the seeds resemble in form those of the Buckland's Sweetwater.

A considerable number of other crosses were made between one of the cultivated forms know as Concord, which is believed to have been derived from the fox grape, *Vitis labrusca*, and varieties of *Vitis vinifera*. The leaves of the Concord vine are thick and leathery, and downy on the under side, while the leaves of the derivatives of *Vitis vinifera* are smooth below and comparatively thin in texture. All the seedlings resembled the Concord in the character of their foliage, but there was much variation in the appearance and quality of the fruit.

The Raspberry and Blackberry.

The first crosses were made with raspberries in 1869, and the work has been continued at intervals up to the present time. In 1869 a red variety, known as the Philadelphia, a form of *Rubus strigosus*, which was very productive but lacking in flavour, was crossed with a high-flavoured yellow sort known as Brinckle's Orange, but the progeny in this case was tender and unhealthy in character and none of them have survived. In 1870 a cultivated form of the black cap raspberry, *Rubus occidentalis*, was fertilized with pollen of the Philadelphia. This latter experiment was undertaken mainly for the purpose of gaining some information as to the influence of sex on the character and habit of the offspring. The black raspberry, *Rubus occidentalis*, which was chosen as the female, propagates by rooting from the pendulous tips of the branches, which, late in the season, touch the ground; while the male, the red raspberry, *Rubus strigosus*, sends up suckers from the buds developed on the roots, and these roots extend under the surface to a considerable distance from the base. Twenty-four plants were raised from this cross, all of which fruited in 1873, and some of them were very prolific. In every instance the seedlings rooted from the tips, but not freely, and in two or three instances an occasional sucker was thrown up from the roots, a few inches from the crown. Subsequently these plants were propagated more freely by layering in spring the canes, the growth of the previous summer, when they rooted at almost every joint. The fruit of the best of these hybrids was larger than that of either of the parents; it was intermediate in colour, being dark purple with a whitish bloom, while the flavour was a striking combination of the characteristics of both.

During the following four or five years many additional crosses were made with raspberries, and many attempts were made to cross the raspberry *Rubus strigosus* with the blackberry *Rubus villosus*, but without much success. Most of the efforts failed, but seeds were produced on several occasions. Sometimes these did not germinate, and several times, when one or two seeds did start, the young plants were weakly and died before much growth was made.

Large Fruits.

Many crosses were also made with the larger fruits, from 1889 to 1895, some of which have since borne well; but they were not sufficiently promising to justify their propagation. Many attempts have been made to cross the apple with the pear, and *vice*

versa, but without success. Similar experiments have also been tried with the different varieties of cherries, notably those belonging to the Bigarreau class with the Duke and Morello types. Seedlings of these were grown for a time, the foliage of which was intermediate in character, but none of them lived long enough to produce fruit. Efforts were made to cross the plum with the peach, also the plum with the cherry, both without success. After the work of cross-fertilizing fruits had been continued for eight or nine years, the number of seedlings accumulated to such an extent as to be burdensome to look after, and further efforts, which would have added to their number, were for a time suspended.

Flowering Plants.

In the meantime some experiments were made with flowers. Attempts were made for several seasons to cross the wild geraniums, *Geranium maculatum* and *G. robertianum*, with several of the best cultivated pelargoniums, with the hope of obtaining improved forms of hardy perennial geraniums, but without success. A wild perennial species of verbena, *V. hastata*, was pollenized with some of the finest forms of the cultivated verbena, with a similar object; and in this instance a number of crosses were obtained, but these were planted out in an open border without protection, where they all died during the following winter. Crosses were also made with Aquilegias, and very distinct intermediate forms obtained. Experiments were also tried to see if evidence could be had of superfoetation in this flower, the varieties of which are so easily cross-fertilized. The sorts selected for this work were a red-flowering form, *Aquilegia Canadensis*, and the double blue and white forms of *Aquilegia vulgaris*. The red was crossed with the white and the pistils touched the following day with pollen from the blue flowers; the white with the blue, and retouched with the red; and the blue with the red, and retouched with white. A large number of seedlings were raised, most of which showed two colours quite distinctly, but no trace of the influence of the third colour could be detected in any instance.

Wild Crab Apples.

In the spring of 1887, among other seeds received from the Royal Botanic Gardens at St. Petersburg there was a package of the seeds of a small wild Siberian crab, known as the berried crab, *Pyrus baccata*. From these a number of young trees were raised, some of which have now been tested at the branch experimental farm at Brandon, Manitoba, for six years, and at Indian Head, N.W.T., for five years, and in every instance these trees have been found quite hardy, and during the last two seasons some of them have borne good crops of fruit. This crab, although it bears abundantly, has very small fruit, not much larger than a cherry. Another variety, known as *Pyrus baccata prunifolia*, is more than double the size of *P. baccata*, and this also, although tested for a shorter time, appears to be equally hardy. These trees are dwarf in habit, with branches extending close to the ground; they are also very sturdy and thickly branched and from their build are well adapted to resist the winds and other climatic difficulties from which many trees suffer on the North-west plains.

Having tried during the past nine years, under many different conditions as to shelter, about 200 varieties of the hardiest sorts of cultivated apples and crab apples obtainable from Northern Europe and elsewhere, at both these North-west farms without success, efforts are now being made to improve the two wild crabs referred to, in size and quality of fruit, by cross-fertilizing them with many of the hardiest sorts of apples grown at Ottawa, also with the larger crabs. The first crosses were obtained in 1894 and the young trees, which came up in 1895, were transplanted from the seed bed to a small experimental orchard on the Central Farm, in 1896, where they are now growing to the number of 175, and some of these will probably fruit within two years. The foliage of these seedlings varies much in character, some resembling that of the varieties of cultivated apples used as the male, while others are more like that of the wild type of the female. During 1896 and 1897 this work has been continued on a much larger

scale and orchard plots suitably protected are being provided at each of the branch experimental farms in the North-west, large enough to admit of the testing of all the young seedlings as fast as they can be produced, and it is confidently expected that within a very few years, as a result of this work, varieties of apples will be available for cultivation in the North-west, of a hardy character and such as will be valuable to the settlers on the plains.

Cherry and Plum.

Fig. 8.

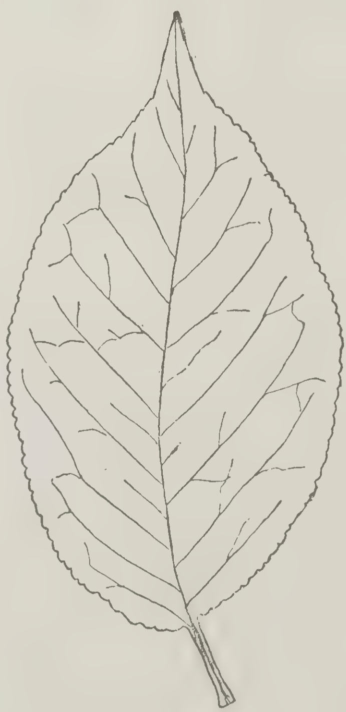


Fig. 9.

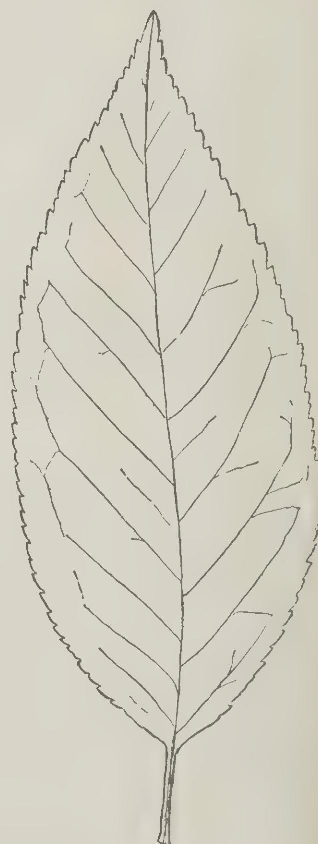


Fig. 10.

The Sand Cherry, *Prunus pumila*, a native fruit, which is very hardy and has a wide distribution, was chosen as the starting point for another line of experimental work. The usual wild form of this fruit is a small black cherry with a disproportionately large stone covered with a thin coating of juicy but astringent flesh. Specimens are, however, occasionally found having fruit fully twice the usual size, with a much larger

proportion of pulp and of very fair quality. All attempts to cross this with different varieties of cherry have failed, but in 1896 a single cross was effected with a variety of cultivated plum known as Col. Wilder, an improved form of *Prunus americana*. The seed from this cross was planted in the autumn of 1896 and germinated in the spring of this year. The young tree has made a strong and vigorous growth, and at the present time is nearly 2 feet high, with leaves much wider than those of the Sand Cherry, and closely resembling those of the plum. Figure 8 represents the leaf of the Sand Cherry and 9 the leaf of the plum, while 10 shows that of the hybrid. Fruit of this interesting cross will be watched for with interest.

The wild plum, *Prunus americana*, which is found native in the river valleys in Manitoba, has been crossed during the present season with several of the improved forms of the cultivated plum, from which some good results are expected.

Spring Wheat.

In most parts of Canada the summer season is comparatively short, and hence it is very important to secure as far as is practicable, early ripening varieties of grain. In 1888 some crosses were effected with spring wheat, using a Russian variety known as the Ladoga, as female, and both the Red and White Fife varieties as male. The Ladoga was obtained from Northern Russia and ripens about a week earlier than the Fife wheats; it is, however, lacking in vigour and does not average as heavy a yield as the Red or White Fife and the grain is not so fine in quality. The object in attempting this cross was to obtain, if possible, a wheat equal in quality, vigour and productiveness to the Red Fife, and at the same time, earlier in ripening, and thus to combine the good qualities of both parents. Most of these crosses are intermediate in earliness and ripen at least three or four days earlier than the Red Fife. Some promising sorts have sprung from this source, which are rapidly growing in favour, notably Preston and Stanley from Ladoga and Red Fife, and Alpha and Percy from Ladoga and White Fife.

Another source whence early ripening grain has been obtained, is India, where, in 1889, through the kindness of Lord Dufferin, then Viceroy, a number of different sorts were collected and forwarded to Canada for test on the experimental farms. These were obtained at different altitudes in the Himalaya Mountains, of from 420 to 11,000 feet. All the Indian varieties tested have been early in ripening, and two of the earliest and most promising of the wheats—Hard Red Calcutta and Gehun—ripen as early as the Ladoga, but, in common with all the varieties tested from India, they have lacked vigour and productiveness. These have also been crossed with Red Fife and the crosses have derived earliness of ripening from the Indian blood, with increased vigour and productiveness from that of the Red Fife.

Where a bearded wheat has been used as the female and a beardless type as male, a large proportion of the progeny has at first been bearded. With the second sowing, both the bearded and beardless sorts sport, the beardless varieties frequently producing bearded heads, while the bearded ones more rarely produce those which are beardless. The bearded varieties will vary in the length and stiffness of the beards, and many of them vary in the colour of the chaff, some in the same cross having white chaff, others red; the chaff also varies as to its smooth or downy character. Any of these varieties may be made permanent by persistent selection.

In a cross between Red Fife, male, and an Indian variety of wheat named Spiti Valley, female, both of which were beardless, several bearded sorts were produced in the second generation.

Some winter wheats have been crossed with spring wheats, using the spring varieties as female. These have all ripened when sown as spring wheats, but, although the plants have had vigorous foliage, they have been slow in heading and later in ripening than most of the spring wheats, and as they have not proved specially productive, most of them have been discarded.

This work has been continued from year to year and gradually extended so as to include barley, oats and pease, and during the past nine years more than 700 new varieties have been produced among these important farm crops. All those which show a lack of vigour, or are unpromising for other reasons, are promptly discarded; but there are still under test at the Central Experimental Farm more than two hundred new varieties, all of which are of more or less promise. In a test of the comparative yield of 39 varieties of spring wheat, including all the named ones, with the cross-bred sorts, carried on last year at all the experimental farms, the Preston, one of the crosses referred to between Ladoga and Red Fife—a bearded sort—headed the list, with an average of 35 bushels 37 pounds per acre; while Stanley, a cross of the same parentage, but beardless, stood fifth in order of yield, with 31 bushels 50 pounds per acre.

Barley.

Some very distinct hybrids have been produced between the two-rowed barley *(Hordeum distichon)* and the six-rowed *(Hordeum hexastichon)*. These are ancient types and have long been regarded as distinct species. The six-rowed type has been found, according to DeCandolle, in the earlier Egyptian monuments and in the remains of the lake dwellings of Switzerland. The two-rowed barley is said to have been found wild in Western Asia, and is also of ancient origin. In the two-rowed barley, the additional rows found on the six-rowed form are represented by chaffy scales lying flat on the face of the head. In the hybrids produced by using the six-rowed form as male, these chaffy scales in some instances are all filled; in others, only a part of them are filled and the kernels at first are usually smaller and thinner than those which occupy the normal position on either side of the head. With subsequent cultivation the relative size of the kernels is more equalized and, in some cases, they become very even in size throughout. The two-rowed barley stools much more freely than the six-rowed sorts, the heads are also longer, and the objects in mind in effecting these crosses have been to produce varieties of six-rowed barley with longer heads and with an increased tendency to stooling. Several have manifested a prolific character. One produced from a single grain 4,529 grains, and the next year the crop was 28 pounds. In another instance 2,274 grains were grown from a single grain, and the crop the second year was 15½ pounds. A considerable number of these hybrid barleys are now being tested in field culture, and some of them have made promising records.

Wheat with Rye.

Many attempts have been made at the Experimental Farm to cross wheat and rye, but without success until 1892, when one of my assistants in this work, Mr. W. T. Macoun, succeeded in effecting a cross, using a variety of winter wheat as female and winter rye as the male. The one resulting kernel was sown in September, 1892, and, although to all appearance it was a wheat kernel which was sown, the plant which grew from it had the purplish appearance of rye, and the heads at the time of spearing had stripes of purple on the spikelets, as in rye, and in other respects closely resembled rye. Nineteen heads in all were produced on the plant, but there was not a single kernel found in any of them.

Oats.

Some experiments have also been made in the crossing of oats and crosses have been effected between those with branching and those with sided heads; also with white and black oats, white and yellow, and with thin hulled and thick hulled sorts. Many striking instances of intermediate forms have been secured and some of the new varieties have given excellent crops.

Pease.

About 175 crosses have been made in this group and some promising and prolific forms originated. By rigid selection and rejecting of all the less promising sorts, the varieties under test have been reduced to less than one-third of the original number, and further testing is now limited to 56 varieties.

The Barberry.

The last group of hybrids to which I propose to refer is one between *Berberis Thunbergii*, female, a Japanese species, and the common purple barberry of Europe, *Berberis vulgaris purpurea*, male. The differences between these two species are very marked and the evidences of the hybrids of which there are four partaking of the characteristics of both parents seem to be clearly shown.

In *Berberis Thunbergii* the branches are armed with thorns which are about $\frac{3}{8}$ths of an inch in length, with a short branch on either side, near the base, the branches being about one-fourth the length of the central spine. In *B. vulgaris purpurea* the thorns are long, being about $\frac{6}{10}$ths of an inch, with the side branches near the base varying from half to two-thirds the length of the centre spine. Whereas, in the hybrid the two branches which spring from the base are about equal in length with the centre, showing in this respect a departure from both parents, but more nearly resembling the male.

Fig. 11.

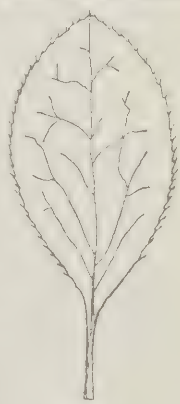


Fig. 12.

The leaves of *Berberis Thunbergii* are small, obovate, tapering towards the base, a leaf of this species is shown in figure 11, with the surface smooth on both sides and the margin entire; colour, deep green above, paler beneath. In *B. vulgaris purpurea* the leaves are larger and nearly oval, with the margin fringed with sharp spines (see figure 12). The upper surface is of a dull brownish purple colour; below it is green, with more or less of a purplish hue. In the hybrids the leaves are longer and broader than in *B. Thunbergii* with five or six short spines at wide intervals along the margin on each side and another short spine at the tip (see figure 13). The upper surface of the leaves is dark green, more or less tinged with purple, the purple shading being quite decided in the young growth. The lower surface is of a paler shade of green.

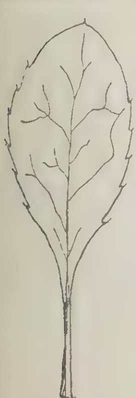


Fig. 13.

Fig. 14.

In *Berberis Thunbergii* the flowers are borne singly on the under side of the branches and are loose and open, with both calyx and corolla of a very pale yellowish colour (figure 14). The outer surface of the calyx is tinged with red and the stamens are yellow. In *B. vulgaris purpurea* the flowers are in long clusters, from 17 to 21 in a cluster (figure 15); they are of a bright yellow colour, with the outer surface of the calyx bright red and the stamens yellowish green. The flowers are smaller and more compact than in *B. Thunbergii* and are nearly a week later in time of blooming. In the hybrids the flowers are borne in clusters of from five to nine in each (figure 16); they are loose and open and a little larger than those of *B. Thunbergii* and *B. vulgaris purpurea*.

The young fruit of *B. Thunbergii* when first formed, is of a pale green colour; that of the purple barberry is of a bright red hue; while the fruit of the hybrids is of a dull reddish shade.

Fig. 15.

Fig. 16.

From these particulars it will be seen that the hybrid barberries, of which there are four, are intermediate in character between the parents, in leaf, flower and fruit, also in the time of blossoming.

Very efficient help has been rendered me in carrying on this work during the past nine years, by my assistant, Mr. W. T. Macoun; also by Dr. C. E. Saunders, who has done much of the recent work on the fruits, and Dr. A. P. Saunders, who made some of the earlier crosses in wheat and who rendered special assistance in the cross-fertilizing of cereals at the branch experimental farms during the summer of 1892.

TUBERCULOSIS.

It is much to be regretted that further trouble has developed from this disease, more particularly among the cattle at the Central Farm. When Bulletin No. 20 was published, in February, 1894, and the subsequent report issued on the branch farms in the annual report of the experimental farms for that year, giving full particulars of the discovery of tuberculosis and the means applied for its eradication, with the very thorough after precautions taken in disinfecting the premises, it was hoped that immunity from this disease would be had in future. At that time, however, the insidious nature of tubercular disease, the extent to which it prevails and the difficulty of completely eradicating it, were not so fully understood as now, and with the reliability of tuberculine thoroughly established and the process of testing officially recognized, there will probably be no difficulty in future in the way of using the tuberculine test from time to time, and thus preventing any lurking germs of this disease from further spreading in the herd.

After the number of cattle had been reduced at the Central Farm by the slaughter necessary to get rid of this disease in 1893, additional cows were required to carry on some experiments in dairying. These could not be bought at that time subject to the tuberculine test, the use of tuberculine as a test for the disease had been but very recently introduced, and many skilled veterinarians did not believe in its reliability, and

it was generally disbelieved in by those engaged in the cattle trade. Negotiations were also then in progress with the British Government looking to the removal of the embargo on Canadian cattle, and it was held to be most unwise, by those interested in the export of cattle, that any further attention should be drawn to this disease, which had in several instances been referred to in the press, either ignorantly or with an object, as pleuro-pneumonia. Under these circumstances, it was decided that any animals required for the use of the farms should be selected with care from healthy herds, and subjected only to the test of physical examination. Thus a number of grade cows were selected in Quebec and Ontario and placed in the barn, every one of which appeared to be perfectly healthy. No pure-bred animals were purchased.

From the experience recently had it is probable that some incipient germs of the disease must have existed in one of the young animals (a Jersey bull), which was tested in 1893 and did not then react, and that these subsequently developed. It also seems clear, from the post mortem examinations, that in the case of two of the grade cows which were purchased in Ontario the disease had developed to that extent to justify the belief that these animals were more or less diseased when they were purchased. It was in all probability from these two sources that the disease spread in the herd, and in confirmation of the correctness of this view it may be said that most of the other animals which reacted when the tuberculine test was used showed the disease but slightly developed, as if the infection had been recent.

While there is no doubt that a diseased animal in the herd is the most common cause of the spread of the disease, there are other possible sources of infection. This is undoubtedly an infectious disease, which can only be produced by the introduction into the system of those minute organisms known as the bacilli of tuberculosis. As this disease is identical with consumption in the human family, and may be communicated from man to animals, as well as from animals to man, it is evident that in a public institution which is visited annually by many thousands of people, this additional source of danger to the cattle is always present.

In September last some purchases were made of pure-bred animals for the improvement of the herds at Nappan and Ottawa. Since animals had been bought and exchanged several times at Nappan since 1893 without submitting them to the tuberculine test, it was decided that this test should be again applied to all the herd there. It was also the intention that similar precautions should be taken at each of the other experimental farms as soon as they could be conveniently arranged for. During a visit made to the Nappan farm by the writer early in October all the animals were tested with tuberculine by Dr. Jakeman, of Halifax, and Dr. F. G. Hall, of Amherst, and no reaction occurred in any case, showing that this herd was free from tuberculosis.

Up to this time there had not been the slightest suspicion that there was anything wrong with the herd in Ottawa. No symptoms had at any time occurred to awaken such suspicion, and the animals appeared to be in excellent health. Before arrangements had been made for the testing of the herd in Ottawa, on the 21st of October the Jersey bull already referred to, which had not fed well for a day or two and was supposed to be suffering from a slight attack of indigestion, died from the effects of an overdose of saltpetre, which, through the misunderstanding of an order, was bought in place of salts. On post mortem examination of this bull one lung was found to be badly affected with tuberculosis. Arrangements were at once made to test the entire herd, and the tests were conducted by Drs. James and Perley, of Ottawa. Particulars of the temperatures observed are given in the appended chart. The normal temperatures were taken 23rd October, the tuberculine was injected that evening and the reactions noted 24th October.

Tuberculine Tests.

Number.	Name of Animal.	Age, Years.	Normal Temperature.				Temperature after injecting Tuberculine.						Extent of Reaction.
			8 a.m.	11 a.m.	1 p.m.	5 p.m.	6 a.m.	9 a.m.	12 p.m.	3 p.m.	6 p m.	9 p.m	
1	Beauty, grade cow.....	11	101	101·6	101 4	101	101·7	101	101·4	101	100·2	.. .	− ·2
2	Devon Bull (Earl of Salcomb)	5	100·6	100·6	101·4	101	102·1	104·4	106·6	103	102·4	102	+5·2
3	Canadian Bull.........	7	100·8	101·4	101·4	101·6	100·6	100·8	102·4	102·8	102·2	. .	+1·2
4	Ayrshire Bull.........	9	100	101	100·6	101·2	100	101	104	102·3	102	102	+2·8
5	Holstein Bull.........	5	101·6	102	101·4	100·8	101·4	100·7	102	103	103·6	....	+1·6
6	Ayrshire Cow Maggie.	14	101·3	101·4	101	100·2	101	102	106	105·6	106·4	105·2	+5
7	Forest Girl, grade.....	12	101·4	101·2	101·2	101	101	102	100·7	102	100	......	+ ·8
8	Nancy, grade.........	10	101·4	101·6	101·2	100	102·2	105·6	105·1	104·5	104·5	104·8	+4·6
9	Mayflower, grade......	9	101·2	101·4	101·6	100.2	102·3	105·5	106·3	106·1	105·8	105·2	+4·7
10	Geranium	11	101·2	101·4	101·4	100·1	101·4	103·6	105·4	103·6	102	101	+4
11	Clara..	7	101·4	101·4	102	101·4	102·6	105	107	106	105·6	104·6	+5
12	Gladiolus..............	12	102	102	101·6	101·2	101·4	105·6	106·6	106 3	107	103·3	+5
13	Oriole	3	101·6	101·4	101·4	101·2	101·4	103·6	105·9	105	105·2	104·3	+4·3
14	Spot	3	102	101·4	102·2	100·6	103	105·8	106·2	105·2	103·8	103·6	+4
15	Rosemary.............	3	101·4	101·6	102	100·4	106	107·4	106	105·2	104	103·2	+5·4
16	Jewel....	5	101	101·4	102	100·2	103·4	106·6	107·2	104	104·2	101	+5·2
17	Lady Cornelia.........	5	101·4	101·8	102	101·3	103·5	106	106·2	105·2	104	103·7	+4·2
18	Annie Rooney.........	6	101·6	102	102·4	101	101·6	102	104·2	104	104	102·2	+1·8
19	Pauline....	12	101·8	103	103·2	103	102·6	103·2	104·8	104	105	104·6	+1·8
20	Topsy	6	101·2	101·7	101·9	101·2	103·4	107·4	107	106	106	104·6	+5·2
21	Florence..............	9	100·2	101·4	101·4	100·6	101·6	101·6	101·8	102·2	100	......	+ ·2
22	Clenna Rex...........	9	100·4	100·4	100·4	100·6	101·7	102	104	103·6	104·8	103·6	+4·2
23	Lily Rex..............	4	102	102	102	101·2	102·7	107	106·6	106·2	103·2	102	+5
24	Nancy Rex...........	3	101·4	101·2	102·8	101	101·6	101	101·6	101·8	101·2	......	−1
25	Louette	7	100·8	101·2	101·4	100·4	103	106·6	106·9	103·2	105·6	106·2	+5·5
26	Therese	9	100·6	100·8	101·8	100·6	101	100	102	102·8	100·2	......	+1
27	Verbena.............	9	101·4	100·8	101·4	100·2	101·6	101·4	101·6	101·2	100	....	+ ·2
28	Dolly................	6	101·2	101	101·4	100·4	101·3	104	103·9	103	100·4	101	+2·5
29	Hazel...............	9	100·6	101·4	101·6	100·6	102	102	101·4	101·2	101	.....	+ ·4
30	Linda	10	101·2	101	101·2	100·8	101·4	101·4	101	102	101·2	.....	+ ·2
31	Rosella...............	2½	102	101·8	101·8	101·2	105·6	107	107·2	105·6	105	103·9	+5·2
32	Primrose.............	7	101·6	102	102·3	101	102·2	104	106·2	104	103	103	+3·9
33	Madame..	10	101·4	101	101·2	100	102·5	105·6	106·9	104·8	103·8	104·8	+5 5
34	Tulip................	3	101·6	101·8	102	100·4	102	101·4	102·2	100·6	101·2	......	+ ·2
35	Margaret.............	10	101	101·4	101·6	101·2	101·6	101 5	102	101	101	.....	+ ·6
36	Noretti..............	6	100·4	101·4	101·8	100·6	101·4	101·4	100	101·2	100	....	− ·4
37	Lady Olga...........	¾	102	102·2	102	102·2	102	102	102·4	102	102	102	+ ·4
38	Neptune.............	½	102	102·2	101·8	101·8	102·2	100·8	102·6	102	102·2	102	+ ·4
39	Florence.............	¾	101·5	101·6	101	101	101·4	100·7	102	101·8	101·4	101	+ ·4
40	Saudie	9	100·6	101·3	101·2	102	151·5	103·2	105·2	105	104·8	103·8	+3·2
41	Julia......	5	101	101·2	101·2	100	100	100·6	101·3	102·3	101·4	101·4	+1·1
42	Empress..............	12	103	103	102·4	103	103	102·6	101·3	103	102·2	102·1	=
43	Olive.................	3	102	102·2	101·8	101·1	101·2	101·6	102·6	102·2	102	102	+ ·4
44	Dairy Maid..........	2½	102	101·2	102·2	101·3	100·4	100·5	102·5	102	101·4	101·5	+ ·3
45	Black Beauty.........	2½	101·4	101·1	101	100·8	101·2	101·3	101·4	101·2	101	100·6	=
46	Butterfly	2	101·8	102	102	102·2	100·9	100·6	101·2	102	102	101·8	− ·2
47	Maude...............	2	102	102	102	101·2	101·6	101·6	101·8	101·4	101·2	101	− ·2
48	May Belle......	2	101·2	101	102·2	101	100·6	100·7	100·9	101	101	101	− ·3
49	Polly................	2	101·4	101·2	101	101·2	101·6	101·8	102·2	102	102·2	102·1	+ ·8
50	Sylvia....	2	102	101·6	101·6	101·4	100·6	100·7	102·2	102	101·4	101·1	+ ·2
51	Queenie...	1½	202	101·6	101·6	101·6	103·8	105·6	106·2	105·4	104·9	104	+4·2
52	Clenna May....	1½	101·2	101·8	101	100·6	100·8	100·6	101·6	101	101	100·7	− ·2
53	Lily Belle............	1½	100·2	101	102·2	102	153·2	105·1	106·9	106	104·2	103·2	+4·7
54	Gem	1½	101·4	100·8	100·8	101·2	100·9	101·8	102·1	101·6	101	100·5	+ ·7
55	Myrtle...............	2½	101·4	102·8	101·1	101·2	100·2	100·5	101·8	102·4	101	101	+ ·6

As soon as possible after the tests were completed all the animals which were free from disease were removed to another building where no animals had been previously kept.

Of those which had reacted, ten of the milking cows were reserved for experimental tests, and these were forwarded to Montreal for that purpose. They are Nos. 6, 10, 12,

13, 14, 15, 16, 17, 22 and 32. The remainder were killed and post mortem examinations made. Dr. D. McEachran, Chief Veterinary Inspector, of Montreal, was present and superintended this work and was assisted by Drs. James and Periey, of Ottawa.

Physical examinations were made of several of the animals before they were slaughtered, but the results only confirmed the opinion now generally held by the best veterinary authorities that it is practically impossible to detect the presence of this disease by the most careful examination, except in advanced cases and where the more important organs are considerably involved.

No. 2. Devon Bull.—Earl of Salcomb, age 5 years; bred at the Experimental Farm; was tested in 1893 and did not then react. Post mortem—Lungs full of masses of soft tubercle, some cheesy. The liver and mediastinal and bronchial glands all contained tubercle in a soft condition, most of it indicating comparatively recent formation.

No. 3. Canadian Bull.—Quintal, age 7 years. Was tested in 1893, but did not then react. Both lungs somewhat diseased, containing nodules of tuberculous matter. A small quantity of tubercle was found at the apex of one lobe of the liver. Bronchial and mediastinal glands diseased and partly filled with tubercle.

No. 4. Ayrshire Bull.—MacDuff, 9 years. This bull was tested in 1893, but gave no reaction then. In one lung there were several small masses of tubercle in different parts of its substance. Mesenteric glands, liver and peritoneum all slightly affected.

No. 5. Holstein Bull.—Netherland Chief, age 5 years; bred at the Experimental Farm; was tested in 1893, but did not then react. A careful examination of all the organs and glands was made and no evidence of disease discovered. In this instance the reaction after the injection of tuberculine was comparatively slight.

No. 8. Nancy.—Grade cow, age 10 years; bought in 1891. In the lungs there were some small patches of tubercle, the mediastinal glands were considerably diseased and the bronchial glands slightly affected.

No. 9. Mayflower.—Grade cow, age 9 years; bought in 1894. In this animal both the lungs and mediastinal glands were considerably diseased.

No. 11. Clara.—Grade cow, age 7 years; bought in 1895. Lungs grown to the ribs and diseased in spots. Bronchial and mediastinal glands considerably affected with soft tubercle.

No. 18. Annie Rooney.—Grade cow, age 6 years; bred at the Central Experimental Farm; was tested in 1893, but did not then react. One of the mediastinal glands was slightly affected. Diligent search failed to reveal any diseased condition in any of the other glands or organs.

No. 19. Pauline.—Grade cow, age 12 years; bought in 1893. In this cow the spleen was very much enlarged and thickened and the interior was filled with masses of tubercle, and one end of this organ was much decayed, of a dark colour, almost black, and gave a very offensive odour. The left lung was very badly diseased. The bronchial and mesenteric glands were also much affected. The indications in this case were that the disease had existed in the animal for a long time.

No. 20. Topsy.—A grade cow, age 6 years; bred at the Experimental Farm; was tested in 1893, did not then react. In this animal the retropharyngeal, mediastinal and bronchial glands were all slightly affected, but no disease was found in any of the large organs.

No. 23. Lily Rex.—A Jersey cow, age 4 years; bred at the Experimental Farm; was tested when a calf in 1893, but did not then react. Small quantities of tubercle were found in several parts of the lungs. The mediastinal glands were also considerably affected.

No. 25. Louette.—A grade cow, age 7 years; bought in 1893. The mesenteric glands, mediastinal glands and peritoneum were all slightly affected. Disease was also found to a slight extent in the udder.

No. 28. Dolly.—A grade cow, age 6 years; bought in 1893. The liver, mesenteric and mediastinal glands were all slightly tuberculous.

No. 31. Rosella.—A grade heifer, age $2\frac{1}{2}$ years; bred at the Experimental Farm. Anterior lobe of left lung considerably diseased; mediastinal glands also tuberculous.

No. 33. Madame.—A grade cow, age 10 years; bought in 1893. Lungs slightly diseased. Bronchial glands considerably affected; mediastinal glands also slightly tuberculous.

No. 40. Saudie.—A grade cow, age 9 years; bought in 1893. One lobe of the lungs was considerably diseased. Liver also diseased at tip of one lobe. The latter, however, was not clearly tuberculous. The posterior mediastinal glands were much enlarged and badly diseased. This cow had probably been affected for some years.

No. 51. Queenie.—A grade heifer, age $1\frac{1}{2}$ year; bred at the Experimental Farm. The peritoneum was very slightly affected with small pustules, which appeared to be tuberculous. The disease was not clearly demonstrated in this case. All the organs and glands were carefully examined, but no tubercle was detected in any of them.

No. 53. Lily Belle.—A Jersey heifer, age $1\frac{1}{2}$ year; bred at the Experimental Farm. A small mass of tubercle was found in one of the lungs; liver very slightly affected. Small tuberculous patches were found distributed over the peritoneum.

After the animals were all removed the barn was thoroughly disinfected as follows: It was first well swept, scraped and cleaned, when the entire surface, including floors, walls, ceiling, stalls and other woodwork, was carefully sprayed with a solution of corrosive sublimate (mercuric chloride) of the strength of 1 in 640, made by dissolving half an ounce of corrosive sublimate, mixed with an equal weight of muriate of ammonia (ammonium chloride) in 2 gallons (20 pounds) of water. Sulphur was next used—burned in three iron pans placed on the floor in different parts of the building, with the doors and windows all closed, and this fumigation was maintained for about 12 hours. The day following, about 3 p.m., a second fumigation was begun with muriatic acid gas, prepared as follows: Twelve open glazed earthenware dishes were procured, each capable of holding about six pints, which were elevated on ordinary flour barrels equally distributed throughout the building, and all openings carefully closed. In each of these dishes was put $2\frac{1}{2}$ pounds of common salt (sodium chloride) and on this was poured one pint, fluid measure, of strong sulphuric acid. Muriatic acid gas was rapidly disengaged from each generator, and in a short time the fumes were so dense as to saturate the air in the barn with a thick cloud of vapour. Gas was constantly given off all night and every nook and corner penetrated, and exhalations from the vessels had not ceased when the building was opened the following morning.

Subsequently the walls and woodwork were swept, and a second spraying made similar to the first with the corrosive sublimate solution. Then the floors, stalls and passages were all thoroughly soaked with the corrosive sublimate solution by means of mops and afterwards scraped with sharp hoes, so as to remove all coating from the woodwork, then mopped again with the corrosive sublimate solution freely used and subsequently allowed to dry. After this the walls, ceiling and stalls received three coats of lime whitewash, when the cattle which were free from disease were returned to the barn. Twenty-two steers were subsequently bought for feeding experiments. These were isolated until tested with tuberculine, but no reaction took place in any case, showing that they were free from disease. These have since been placed in the barn with the other cattle.

The instructions sent to the branch experimental farms in the west to have the tuberculine test applied to all the animals have since been carried out.

EXPERIMENTAL FARM, BRANDON, MANITOBA.

At this farm the herd consisted of 20 animals, all of which were tested by Dr. Cox, V.S., of Brandon, from 6th to 8th of December, and found free from disease. Twelve steers, which were purchased for experimental feeding tests and kept isolated until the tuberculine could be used, have also been tested and one of these reacted, the highest temperature being two degrees above the highest normal.

This animal was slaughtered and a careful examination made, but no evidence of the disease was found.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

The herd at this farm consisted of 51 animals, all of which were subjected to the tuberculine test by Inspector Burnett, V.S., of the Mounted Police, early in December, and only two reacted. In one case a Durham cow, Prairie Wildflower, six years old, the highest reaction was $2\frac{2}{5}$ degrees above the highest normal; in the other, a Holstein cow, Abi 2nd of Assa., five years old, the reaction was greater, the temperature reaching $3\frac{2}{5}$ degrees above the highest normal. Both these animals were tested in 1894 and did not then react. On examination after killing the disease was found in the Durham cow in several of the organs, and in the Holstein the lungs were both slightly affected. Evidence of the disease was also said to have been detected in connection with the heart.

EXPERIMENTAL FARM, AGASSIZ, B.C.

At this farm the herd numbered 19 animals. These were all tested with tuberculine by Dr. J. Gibbins, of Vancouver, on December 14 and 15, and no reaction occurred in any case, showing that no tuberculous disease existed there.

EXPERIMENTS IN THE FEEDING OF STEERS, 1896-97.

During the past season three groups of steers, four animals in each group were fed for 16 weeks, with the object of ascertaining how far it is economical for farmers to withhold grain during the first part of the feeding period. All were fed on the same bulky fodder mixture, consisting of 50 lbs. of Indian corn ensilage, 25 pounds of roots, 5 pounds of cut hay and 5 pounds of cut straw. This ration was also used at the outset, for the preparatory feeding from 15th November to 15th December, 1897. No meal was given during this period, and the food consumed was not weighed. Before the feeding tests began the twelve steers were divided into three very even groups.

The meal which was used in these experiments was made of equal parts by weight of pease, barley, oats and bran, and in estimating the cost of the rations, this mixture has been valued at the uniform rate of one cent per pound.

In estimating the cost of the rations the ingredients composing the bulky fodder portion have been valued at the following prices:—Corn ensilage at \$2 per ton, roots at \$2 per ton, hay at \$8 per ton and straw at \$4 per ton. The value of these ingredients will vary in different localities, but they have been fixed at about the cost of production at Ottawa and will afford a basis for comparison in all parts of the Dominion.

The feeding period was divided into three portions, one of 8 weeks and two following of 4 weeks each.

To group No. 1 no meal was given for the first eight weeks, 2 pounds of meal were given to each animal per day for the next four weeks, and 6 pounds to each animal per day for the last period of four weeks.

To group No. 2 two pounds of meal were given to each animal per day for the first period of eight weeks, four pounds to each per day for the next four weeks, and six pounds each per day for the last period of four weeks.

To group No. 3 four pounds of meal were given to each steer per day for the first period of eight weeks, and six pounds to each per day for the two remaining periods of four weeks each.

These rations are not as rich in digestible protein (flesh forming material) as are usually recommended in standard rations. They have a wider nutritive ratio that is a larger proportion of digestible carbohydrates (starch, sugar, gum, &c.,) and fat to the protein than the standard rations usually contain. The standard feeding rations for

steers vary from 1 of protein to 6 to 8 of carbohydrates and fat whereas the nutritive ratio in the rations used in these experiments were about as follows :—

Group 1.—1st 8 weeks 1·11, next 4 weeks 1·10, last 4 weeks 1·8·5.
Group 2.—1st 8 weeks 1·10, next 4 weeks 1·9·4, last 4 weeks 1·8·5.
Group 3.—1st 8 weeks 1·9·4, remaining 8 weeks 1·8.5.

During the course of these tests the steers had all of the bulky fodder mixture they would eat up clean, they had access to water in a trough in front of their stalls and were supplied also with salt in a small box at the side of the manger.

The steers were weighed when purchased and were weighed again three times on 17th December at the close of the preparatory feeding. The first weights taken and the average of the three last weighings were as follows, the weights being given in the order in which the animals were finally grouped :—

Group 1.	15th Nov.	15th Dec.	Group 2.	15th Nov.	15th Dec.	Group 3.	15th Nov.	15th Dec.
No. 1......	1,050	1,070	No. 5......	1,140	1,150	No. 9......	1,170	1,205
" 2......	1,010	1,020	" 6......	1,070	1,095	" 10......	1,095	1,115
" 3......	1,085	1,120	" 7......	1,075	1,090	" 11......	Raised at C. E. F.	1,060
" 4......	1,130	1,170	" 8......	1,050	1,075	" 12......	Raised at C. E. F.	1,035
Totals..	....	4,380	....	....	4,410	....	....	4,415

From the figures given it will be seen that the heaviest of the three groups as arranged for the test was only 35 lbs. heavier than the lightest of the groups.

Group No. 1.

Results for the first eight weeks, during which time no meal was given.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 1....................	65·55	....	110	1·96	7·87	4 02
No. 2....................	65·55	....	80	1·43	7·87	5 50
No. 3....................	65·37	....	80	1·43	7·84	5 48
No. 4....................	69·16	....	115	2·05	8·30	4 05
Average..........	66·41	....	96½	1·72	7·97	

Cost of producing each 100 pounds of increase for the group, $4.64

Results for the next four weeks, during which time each animal received two pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 1	63·75	2	70	2·50	9·65	3 86
No. 2	64·92	2	60	2·14	9·79	4 57
No. 3	64·92	2	30	1·07	9·79	9 15
No. 4	68·39	2	35	1·25	10·20	8 16
Average	65·49	2	48¾	1·74	9·86	

Cost of producing each 100 pounds of increase for the group, $5.66.

Results for the remaining four weeks, during which time each animal received six pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 1	60·68	6	48	1·71	13·28	7 77
No. 2	60·68	6	54	1·93	13·28	6 88
No. 3	60·68	6	64	2·29	13·28	5 80
No. 4	64·57	6	56	2·00	13·74	6 87
Average	61·65	6	55½	1·98	13·39	

Cost of producing each 100 pounds of increase for the group, $6.76.

GROUP No. 2.

Results for the first eight weeks, during which time each animal received two pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 5	63·70	2	70	1·25	9·64	7 71
No. 6	65·46	2	115	2·05	9·86	4 81
No. 7	65·55	2	110	1·96	9·87	5 04
No. 8	65·55	2	110	1·96	9·87	5 04
Average	65·06	2	101¼	1·80	9·81	

Cost of producing each 100 pounds of increase for the group, $5.42.

Results for the next four weeks, during which time each animal received four pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 5	60·79	4	80	2·86	11·29	3 95
No. 6	64·79	4	48	1·71	11·77	6 88
No. 7	64·79	4	55	1·96	11·77	6 01
No. 8	64·79	4	45	1·61	11·77	7 31
Average	63·79	4	57	2·03	11·65	

Cost of producing each 100 pounds of increase for the group, $5.72.

Results for the remaining four weeks, during which time each animal received six pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 5	58·36	6	66	2·36	13·00	5 51
No. 6	60·54	6	31	1·11	13·26	11 95
No. 7	60·29	6	34	1·21	13·23	10 93
No. 8	58·86	6	14	·50	13·06	26 12
Average	59·51	6	36¼	1 30	13·14	

Cost of producing each 100 pounds of increase for the group, $10.15.

Group No. 3.

Results for the first eight weeks, during which time each animal received four pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 9	65·61	4	60	1·07	11·87	11 09
No. 10	64·52	4	125	2·23	11·74	5 26
No. 11	64·84	4	115	2·05	11·88	5 79
No. 12	59·12	4	120	2·14	11·09	5 18
Average	63·52	4	105	1·87	11·64	

Cost of producing each 100 pounds of increase for the group, $6.21.

Results for the next four weeks, during which time each animal received six pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 9	42·96	6	40	1·43	11·15	7 80
No. 10	55·82	6	25	·89	12·69	13 13
No. 11	58·29	6	60	2·14	12·99	6 07
No. 12	58 29	6	80	2·86	12·99	4 54
Average	53·84	6	51¼	1·83	12·43	

Cost of producing each 100 pounds of increase for the group, $6.79.

Results for the remaining four weeks, during which time each animal received six pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 9	57·46	6	37	1·32	12·90	9 77
No. 10	54 36	6	56	2·00	12·52	6 26
No. 11	58·14	6	59	2·11	12·98	6 15
No. 12	58·14	6	32	1·14	12·98	11 39
Average	57·02	6	46	1·64	12·84	

Cost of producing each 100 pounds of increase for the group, $7.82.

The results of the foregoing experiments appear to show that it is economical to withhold the feeding of grain, or to feed but little of it, during the first portion of the feeding period. The steers in group No. 1 fed without grain for the first 8 weeks cost on an average 9·80 cents per day for the whole period of 111 days; group No. 2 11·10 cents and group No, 3 12·14 cents per day. This shows an average cost of 1·30 cents per day more for each animal in the second group than for those in the first group, and 2·34 cents per day more for each steer in the third group than for those in the first group. This makes the average cost of feeding each animal in the second group for the 111 days during which these tests were continued $1.44 more than for those in the first group, while the average gain in weight at the close of the experiment was six pounds more per head in the first group than it was in the second. The steers comprising the third group cost on an average $2.60 per animal more than those in the first group, while the advantage in gain was only 1¾ pounds per head.

	Lbs.
Group No. 1—Total gain per steer for full feeding period 16 weeks....	200½
" No. 2 " " " "	194½
" No. 3 " " " "	202¼

EXPERIMENTS IN THE FATTENING OF SWINE.

Experiments in the fattening of swine have been continued since 1890, using different rations from year to year with the object of gaining information as to the best methods of producing pork of the best quality and at the lowest cost. In all cases particulars have been given reg ing the different sorts of feed used and the quantities consumed, also the increase in live weight of the animals under experiment.

THE FEEDING OF SWINE WITH SHORTS.

Lot 11.—This pen contained four cross-bred swine, one Yorkshire sire with Berkshire dam, farrowed 7th June, 1896, and three Berkshire sire and Tamworth dam, farrowed 26th May, 1896, and were fed entirely on shorts soaked in cold water for 30 hours, and were given all they would eat up clean. This feeding test was begun on 25th September, 1896, and continued for sixteen weeks, or until 6th January, 1897. The pigs were weighed every two weeks, and the increase in weight and the quantity of food consumed, are given in the accompanying table for each four weeks:—

No. of Swine, Four.	Sept. 23.	Oct. 21.	Nov. 18.	Dec. 16.	Jan.6,1897	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	287	408	500	586	624	....
Increase in weight	....	121	92	86	38	337
Feed consumed, shorts	....	452	413	382	241	1,488
" per lb. of increase	....	3·73	4·48	4·44	6·34	4·41

The average live weight of each pig when this feeding test was begun was 71¾ pounds; average weight of each at the conclusion of the experiment, 156 pounds. Sold 6th January, 1897. Shrinkage in weight—

Live weight, fasted 14 hours........................ 624 lbs.
Dressed weight, 24 hours after killing............. .... 457 "
Percentage of shrinkage from weight after fasting........ 22·27

THE FEEDING OF SWINE WITH GROUND BARLEY.

Lot 12.—This pen contained four cross-bred swine, one Yorkshire sire and Tamworth dam, farrowed 7th June, 1896, and three Berkshire sire and Tamworth dam, farrowed 26th May, 1896. These were fed for the whole period of sixteen weeks entirely on barley ground and soaked for 30 hours in cold water; they were given all they would eat up clean.

No. of Swine, Four.	Sept. 23.	Oct. 21.	Nov. 18.	Dec. 16.	Jan. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	291	435	546	694	735	....
Increase in weight	....	144	111	148	41	444
Feed consumed, ground barley	....	531	550	552	299	1,932
" per lb. of increase	....	3·68	4·95	3·72	7·29	4·35

The average live weight of each pig when this feeding test was begun was $72\frac{3}{4}$ lbs.; average weight of each at the conclusion of the experiment, $183\frac{3}{4}$ lbs.

Sold 6th January, 1897. Shrinkage in weight—

Live weight, fasted 14 hours..........................	735 lbs.
Dressed weight, 24 hours after killing....................	548 "
Percentage of shrinkage, from weight after fasting......	25·44 "

THE FEEDING OF SWINE WITH GROUND INDIAN CORN.

Lot 13.—This pen contained four cross-bred swine, one Yorkshire sire and Berkshire dam, farrowed 7th June, 1896, and three Berkshire sire and Tamworth dam, farrowed 26th May, 1896. These were fed for the whole period of sixteen weeks entirely on Indian corn ground and soaked for 30 hours in cold water; they were given all they would eat up clean.

No. of Swine, Four.	Sept. 23.	Oct. 21.	Nov. 18.	Dec. 16.	Jan. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight.....................	296	460	558	665	688	....
Increase in weight.....................	....	164	98	107	23	392
Feed consumed, ground Indian corn...	....	585	457	413	178	1,633
do per lb. of increase....	....	3·56	4·66	3·85	7·73	4·16

The average live weight of each pig when this feeding test was begun was 74 pounds; average weight of each at the conclusion of the experiment 172 pounds.

Sold 6th January, 1897. Shrinkage in weight—

Live weight, fasted 14 hours..........................	688 lbs.
Dressed weight, 24 hours after killing..................	529 "
Percentage of shrinkage from weight after fasting........	23·11

THE FEEDING OF SWINE ON A MIXTURE OF SHORTS, BARLEY AND INDIAN CORN.

Lot 14.—This pen contained three cross-bred swine, one Yorkshire sire and Berkshire dam, farrowed 7th June, 1896, and two Berkshire sire and Tamworth dam, farrowed 26th May, 1896. These were fed for the whole period of sixteen weeks with a mixture of equal parts by weight of shorts, ground barley and ground Indian corn, soaked in cold water for 30 hours; they were given all they would eat up clean.

No. of Swine, Three.	Sept. 23.	Oct. 21.	Nov. 18.	Dec. 16.	Jan. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight....	228	363	448	557	596	....
Increase in weight..................	....	135	85	109	39	368
Feed consumed, equal weights of shorts, barley and corn..................	....	463	420	398	189	1,470
Feed consumed, per lb. of increase....	... .	3 42	4·94	3·65	4·84	3·99

The average live weight of each pig when this feeding test was begun was 76 pounds; average weight of each at the conclusion of the experiment $198\frac{1}{2}$ pounds.

Sold 6th January, 1897. Shrinkage in weight—

Live weight, fasted 14 hours..........................	596 lbs.
Dressed weight, 24 hours after killing..................	447 "
Percentage of shrinkage, from weight after fasting	25·00

THE FEEDING OF SWINE WITH PEASE, BARLEY, OATS AND SHORTS ADDING SIX POUNDS SKIM MILK PER PIG PER DAY.

Lots 15, 16, 17 and 18.—These pens contained twelve cross-bred swine in all, which were fed for twelve weeks on all they would eat up clean of a mixture of equal parts by weight of ground pease, barley, oats and shorts, soaked in cold water for 30 hours with 6 pounds of skim milk per day to each pig. These feeding tests were begun on the 10th March, 1897, and continued for twelve weeks or until 19th May, 1897.

Lot 15.—Consisted of two cross-bred swine Essex sire with Yorkshire dam, farrowed 10th September, 1896.

No. of Swine, Two.	Mar. 10.	April 7.	May 5.	May 19.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	210	255	309	333	....
Increase in weight	....	45	54	24	123
Feed consumed, meal	....	130	154	75	359
" milk	....	336	336	168	840
" per lb. of increase, meal	....	2·88	2·85	3·12	2·91
" " milk	....	7·44	6·22	7	6·82

Lot 16.—Consisted of three cross-bred swine, two Essex sire and Yorkshire dam—farrowed 10th September, 1896, and one Tamworth sire and Berkshire dam, farrowed 10th October, 1896.

No. of Swine, Three.	March 10.	April 7.	May 5.	May 19.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	282	345	418	458	....
Increase in weight	....	63	73	40	176
Feed consumed, meal	....	178	188	103	469
" milk	....	504	504	252	1,260
" per lb. of increase, meal	....	2·82	2·57	2·57	2·66
" " milk	....	8	6·90	6·30	7·15

Lot 17.—Consisted of four cross-bred swine, one Essex sire and Yorkshire dam, farrowed 10th September, 1896, two Tamworth sire and Berkshire dam, farrowed 10th October, 1896, and one pure Berkshire.

No. of Swine, Four.	March 10.	April 7.	May 5.	May 19.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	378	479	585	632	....
Increase in weight	....	101	106	47	254
Feed consumed, meal	....	221	257	143	621
" milk	....	672	672	336	1,680
" per lb. of increase, meal	....	2·18	2·42	3·04	2·44
" " milk	....	6·65	6·33	7·14	6·21

Lot 18.—Consisted of three cross-bred swine, two Essex sire and Yorkshire dam, farrowed 10th September, 1896, and one Tamworth sire and Berkshire dam, farrowed 10th October, 1896.

No. of Swine, Three.	March 10.	April 7.	May 5.	May 19.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	284	340	424	460	......
Increase in weight	....	56	84	36	176
Feed consumed, meal	....	155	218	105	478
" milk	....	504	504	252	1,260
" per lb. of increase, meal	....	2·76	2·59	2·91	2·71
" milk	....	9	6	7	7·15

The average live weight of each of the pigs in these groups, when these feeding tests were begun, was 96⅙ pounds; average weight of each at the conclusion of the experiment, 157 pounds.

THE FEEDING OF SWINE WITH UNGROUND OATS.

Lot 19.—This pen contained four cross-bred swine—two Berkshire sire and Tamworth dam, farrowed 1st May, 1897; and two Yorkshire sire and Berkshire dam, farrowed 6th May, 1897. These were fed for the whole period of twelve weeks with unground oats, soaked in cold water for 54 hours, all they would eat up clean, with 3 pounds of skim milk per day to each pig. This feeding test was begun on the 1st September, 1897, and continued until the 24th November, 1897.

No. of Swine, Four.	Sept. 1st.	Sept. 29th.	Oct. 27th.	Nov. 24th.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	389	443	546	681	....
Increase in weight	......	54	103	135	292
Feed consumed, oats	....	299	421	510	1,230
" " milk	....	336	336	336	1,008
" " per lb. of increase, oats	....	5·53	4·08	3·77	4·21
" " " " milk	....	6 22	3·26	2·48	3·45

To gain information as to how much of this unground grain passed through the swine undigested, the excrement was carefully collected for one day (24 hours) and washed, when, from about 14 pounds of oats fed, 2 pounds 6 ounces of undigested grain was separated, which when dried weighed 22½ pounds per bushel. When tested as to its germinating power, eleven per cent of this grain sprouted.

The average live weight of each pig, when this feeding test was begun, was 97¼ pounds; average weight of each at the conclusion of the experiment, 170¼ pounds.

Sold 25th November, 1897. Shrinkage in weight:—

	Pounds.
Live weight, fasted 14 hours	659
Dressed weight, 24 hours after killing	492
Percentage of shrinkage from weight after fasting	25·33

THE FEEDING OF SWINE WITH UNGROUND BARLEY.

Lot 20.—This lot consisted of four cross-bred swine—three, Berkshire sire with Tamworth dam, farrowed 1st May, 1897; and one, Yorkshire sire with Berkshire dam, farrowed 6th May, 1897. These were fed for the whole period of twelve weeks with unground barley, soaked in cold water for 54 hours, all they would eat up clean, with 3 pounds of skim milk per day to each pig.

No. of Swine, Four.	Sept. 1st.	Sept. 29th.	Oct. 27th.	Nov. 24th.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	397	477	619	797	....
Increase in weight	....	80	142	178	400
Feed consumed, barley	....	354	511	591	1,456
" " milk	....	336	336	336	1,008
" " per lb. of increase, barley	....	4·42	3·59	3·32	3·64
" " " " milk	....	4·20	2·36	1·88	2·52

To gain information as to the proportion of this unground barley which passed through the swine undigested, the excrement was carefully collected for one day (24 hours) and washed, when, from about 17 pounds of barley consumed, 2 pounds 2 ounces of undigested grain was separated, which when dried weighed 35 pounds per bushel. This was tested as to its germinating power, but not one of the kernels sprouted.

The average live weight of each pig, when this feeding test was begun, was 99¼ pounds; average weight of each at the conclusion of the experiment, 199¼ pounds.

Sold 25th November, 1897. Shrinkage in weight:—

	Pounds.
Live weight, fasted 14 hours	798
Dressed weight, 24 hours after killing	592
Percentage of shrinkage from weight after fasting	25·81

THE FEEDING OF SWINE WITH UNGROUND PEASE.

Lot 21.—This pen contained four cross-bred swine, three Berkshire sire and Tamworth dam, farrowed 1st May, 1897, and one Yorkshire sire and Berkshire dam, farrowed 6th May, 1897. These were fed for the whole period of twelve weeks with unground pease soaked, in cold water for 54 hours, all they would eat up clean, with 3 pounds of skim milk per day to each pig.

No. of Swine, Four.	Sept. 1.	Sept. 27.	Oct. 27.	Nov. 24.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	402	498	660	830	....
Increase in weight	....	96	162	170	428
Feed consumed, pease	....	349	505	572	1,426
" " milk	....	336	336	336	1,008
" " per lb of increase, pease	....	3·63	3·11	3·36	3·33
" " " milk	....	3·50	2·07	1·97	2·35

To gain information as to the proportion of the unground pease which passed through the swine undigested, the excrement was carefully collected for one day (24 hours) and washed, when from about 17 pounds of pease fed, only 2 ounces of undigested grain

was separated. This quantity was too small to admit of the weight per bushel being ascertained, and when tested as to germinating power none of these pease sprouted.

The average live weight of each pig when this feeding test was begun was 100½ pounds; average weight of each at the conclusion of the experiment 207½ pounds.

Sold 25th November, 1897. Shrinkage in weight:—

	Pounds.
Live weight, fasted 14 hours	830
Dressed weight 24 hours after killing	626
Percentage of shrinkage from weight after fasting	24·57

THE FEEDING OF SWINE WITH UNGROUND INDIAN CORN.

Lot 22.—This lot consisted of three cross-bred swine, Poland China sire and Yorkshire dam, farrowed 25th June, 1897. These were fed for the whole period of thirteen weeks with unground Indian corn soaked in cold water for 54 hours, all they would eat up clean, with 3 pounds of skim milk per day to each pig. This feeding test was begun on the 29th September, 1897, and continued until the 29th December, 1897.

No. of Swine, Three.	Sept. 29.	Oct. 27.	Nov. 24.	Dec. 22.	Dec. 29.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	216	320	430	537	570	....
Increase in weight	....	104	110	107	33	354
Feed consumed, Indian corn	....	272	319	388	49	1,028
" " milk	....	252	252	252	63	819
" " per lb. of increase, Indian corn	....	2·61	2·90	3·62	1·47	2·90
Feed consumed, per lb. of increase, milk	....	2·42	2·29	2·35	1·90	2·31

To gain information as to the proportion of the unground Indian corn which passed through the swine undigested, the excrement was carefully collected for one day (24 hours) and washed, when, from about 11 pounds of corn consumed, 8 ounces of undigested grain was separated, which when dried weighed 40¼ pounds per bushel and germinated in the proportion of 8 per cent.

The average live weight of each pig when this feeding test was begun was 72 pounds; average weight of each at the conclusion of the experiment 190 pounds.

Sold 31st December, 1897. Shrinkage in weight:—

	Pounds.
Live weight, fasted 14 hours	564
Dressed weight, 24 hours after killing	461
Percentage of shrinkage from weight after fasting	18·26

THE FEEDING OF SWINE WITH MIXED OATS, BARLEY AND PEASE, ALL UNGROUND.

Lot 23. This lot consisted of three cross-bred swine, Poland China sire with Yorkshire dam, farrowed 25th June, 1897. These were fed for the whole period of thirteen weeks on a mixture of equal parts by weight of oats, barley and pease all unground and

soaked in cold water for 54 hours. The pigs were given of this mixture all they would eat up clean and each one received in addition 3 pounds of skim milk per day.

Number of Swine, Three.	Sept. 29th.	Oct. 27th.	Nov. 24th.	Dec. 22nd.	Dec. 29th.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	212	302	407	500	527	
Increase in weight	... .	90	105	93	27	315
Feed consumed, mixed grain	....	245	314	401	49	1,009
" " milk	....	252	252	252	63	819
" " per lb. of increase, mixed grain	....	2·72	2.99	4·31	1·81	3·20
" " per lb. of increase, milk	....	2·80	2·40	2·70	2·33	2·60

To gain information as to the proportion of the unground mixed grain which passed through the swine undigested, the excrement was carefully collected for one day (24 hours), and washed, when from about 11 pounds of grain consumed 10 ounces of undigested material was separated. Of 100 kernels tested as to germinating power, two of the oats only sprouted.

The average live weight of each pig when this feeding test was begun was $70\frac{2}{3}$ pounds; average weight of each at the conclusion of the experiment, $175\frac{2}{3}$ pounds.

Sold 31st December, 1897. Shrinkage in weight:

	Lbs.
Live weight, fasted 14 hours	521
Dressed weight, 24 hours after killing	412
Percentage of shrinkage from weight after fasting	20·92

VISIT TO THE BRANCH EXPERIMENTAL FARM, NAPPAN, N.S.

A visit was paid to the Experimental Farm at Nappan, N.S., in October. Notwithstanding the unfavourable wet weather in the early part of the season, the crops on this farm turned out well, as will be seen from the particulars given in the report of Mr. Geo. W. Forrest appended. The great advantage resulting from the under-draining of land was very clearly demonstrated this year. A large proportion of the land under cultivation on this farm has been tile-drained, and thus outlets have been provided for the prompt discharge of surplus water, which has permitted early and thorough cultivation and given conditions favourable for the growing crops.

Early in October the superintendent, Mr. Geo. W. Forrest, resigned his position, and Mr. R. Robertson was appointed his successor. During the year some of the less useful animals in the herd of cattle were disposed of for beef, and late in the season a number of choice dairy cows were purchased, including some pure bred Guernseys, and these additions have much improved the character of the herd.

In the horticultural division of the work many new varieties of large fruits have been added to the orchards and the plantations of small fruits have been similarly increased. Many varieties of vegetables have also been tested. The ornamental trees and shrubs and sample hedges have all made fair progress, and the flowers in the beds and borders have given a constant succession of bloom throughout the summer.

VISIT TO THE WESTERN BRANCH FARMS.

At the request of the committee of arrangements for the entertaining of the members of the British Association, I left Toronto on August 24th in charge of a party of these distinguished visitors from Europe and accompanied them to the Pacific coast. We were favoured with fine weather during the whole journey and every facility was [illegible] the officers of the Canadian Pacific Railway for seeing the more interesting portions of the [illegible] day. In this way an excellent idea was formed regarding the extent and resources of the [illegible] and unusual opportunities given for seeing its great natural beauties. The extensive wheat areas between [illegible] were all seen by daylight when the harvest was in progress, and opportunity was also afforded for seeing the experimental farms at Brandon and Indian Head and of examining specimens of the more important cereals and other products grown there, also of seeing similar crops at Agassiz and of testing some of the many excellent varieties of fruits produced there. The cities and towns, along the route vied with each other in the hospitalities shown to the members of this distinguished party, and special entertainments were given at Winnipeg, Vancouver and Victoria. The visitors expressed their surprise at the wonderful extent of the country and of its agricultural and mineral resources, and their admiration of the great beauty and diversity of the mountain scenery along the route [illegible] return journey the usual annual inspection of the Experimental Farms was made.

AGASSIZ, B.C.

Several days were spent here in inquiring into the progress of the work and arranging the details of future experimental operations. The season had been favourable and the crops of grain and roots were good and well above the average. The fruit crops also had given satisfactory returns. Apples and pears were fruiting well, the plum crop also had been an excellent one, and considerable quantities of fruit had been shipped to the mining districts in British Columbia and to the towns and cities in Manitoba and the North-west Territories. An additional area of land has been cleared at the experimental farm during the year and brought under cultivation, the fruit orchards have also been further extended and many new varieties of fruit added. The orchards which were planted at different heights on the bench lands on the mountain side are all making good progress, and some of the young trees were heavily laden with fruit. The plantations of forest and ornamental trees are also doing well, and the flower beds and borders have been brilliant and attractive with bloom throughout the season. Excellent progress has been made in all branches of the work and much evidence was afforded of careful and judicious management.

INDIAN HEAD, N. W. T.

The grain crops at this branch farm were very good the past season and the yield of grain has been considerably above the average over a large part of the Indian Head district. Where the land was summer-fallowed many farmers realized thirty bushels or more per acre of first class wheat. At the price which grain now commands such crops are very encouraging and very profitable to the farmer and should bring about rapid settlement of this fertile portion of the great plains.

In the early part of the season the weather was very dry and the outlook on the experimental farm was unpromising, but timely rains in June produced a luxuriant growth and an abundant harvest of grain. Through lack of rainfall in the autumn the crop of roots was very light.

The beneficial effects of the shelter provided by forest plantations on the Indian Head experimental farm were clearly shown during the past season. Plots of several varieties of grain sown within the influence of shelter compared with plots of the same sorts sown beyond such influence, gave a difference of from 25 to 50 per cent in the

yield in favour of the sheltered locations. Further experiments have been carried on with the Awnless Brome Grass, *Bromus inermis*, with very satisfactory results. This grass has now become well known and is much appreciated by the farmers in the territories, who find it to be hardy and reliable, and a most useful grass both for hay and meadow in the North-west country. The farm generally was in excellent order, the buildings and stock were also inspected and found to be in a satisfactory condition.

BRANDON, MANITOBA.

Most of the grain crops on this farm turned out fairly well and some of them were good, but they were not so heavy as those at Indian Head. The Brandon district suffered considerably from drought in the spring and also from the prevalence of unusually severe winds and spring frosts. Oats suffered most and in some instances where the land was exposed a large proportion of the young plants were destroyed. Notwithstanding these drawbacks the crops of grain obtained at the experimental farm were much larger than the average crops of the province and most of the grain was of good quality. The corn crop was lighter than usual owing to very dry weather in the autumn ; for this cause also the yield of roots was below the average.

Experiments have been continued with many grasses for hay and pasture but the Awnless Brome grass takes the lead here as at Indian Head as the most successful in its growth and generally useful in its character of all the varieties thus far tested. The forest belts, avenues and hedges have made good growth and the general collection of trees and shrubs in the Arboretum surrounding the house of the Superintendent is increasing in interest every year. Many promising additions have recently been made to this collection. The general condition of all branches of the work in progress here was very satisfactory.

CHANGES IN THE STAFF.

During the year two changes have occurred in the staff. The Superintendent of the branch experimental farm at Nappan, Mr. Geo. W. Forrest, resigned and Mr. R. Robertson was appointed in his place. Mr. John Craig also resigned his position as Horticulturist of the Central Experimental Farm.

CORRESPONDENCE.

The following is a summary of the letters received and sent out at the Central Experimental Farm from November 30, 1896, to November 30, 1897, also of the number of reports, bulletins and circulars sent out by mail during the same period.

	Letters received.	Letters sent.
Director	32,301	19,408
Horticulturist	2,576	2,495
Chemist	1,249	1,410
Entomologist and Botanist	1,920	2,110
Poultry Manager	1,306	1,159
Accountant	1,319	1,539
	40,671	28,121

Circular letters sent, including circulars sent with samples of seed grain	41,857
Number of Reports and Bulletins mailed	256,736

The large increase in the correspondence and in the volume of farm literature distributed during the past year is an index of the increasing interest taken in the work of the experimental farms. The figures given show that the letters received during the year have averaged 130 per day and the number sent out has averaged 90 per day. The total distribution of reports, bulletins and circulars has reached a daily average for the whole year of 953.

ACKNOWLEDGMENTS.

I acknowledge most gratefully my indebtedness to the Director of the Royal Gardens, Kew, England, for another valuable collection of the seeds of trees, shrubs and plants, also a large collection of willows. Many packages of the seeds of rare and interesting species have also been received from the Director of the Arnold Arboretum, Jamaica Plains, Mass. Further contributions have also come from the Royal Botanic Gardens at Sapporo, Japan. A collection of the seeds of hardy perennials has been received from the Missouri Botanic Gardens at St. Louis, Mo., and another very useful collection of similar plants from the Botanic Garden of Smith College, Northampton, Mass. A large and interesting collection of seeds of useful sorts of trees and shrubs from the northern parts of Russia has also been received from Mr. J. Niemetz, Councillor of State, Winnitza, Podolia, Russia. To Prof. John Macoun, Naturalist of the Geological and Natural History Survey, and to Mr. J. M. Macoun, Assistant Naturalist, my hearty thanks are due for seeds of many rare and useful species collected in different parts of the Dominion.

I desire also to acknowledge the continuance of the faithful services rendered by all the officers at the central and branch experimental farms, and for their earnest and diligent co-operation in carrying on the many lines of experimental work which has been planned.

A special acknowledgment is due to those members of the staff who have rendered me efficient aid in carrying on those branches of the work of which I have had personal charge. To the Farm Foreman, Mr. John Fixter, who has carefully managed and watched over the field experiments and taken notes on the crops at different stages in their growth, also to my assistant, Mr. W. T. Macoun, who, in addition to his work as Foreman of Forestry, which is this year reported on separately, has had charge of all the uniform test plots of cereals and potatoes, also of the small plots of new cross-bred and hybrid cereals, and has taken records of the growth and yield of the many varieties under test. From Mr. R. R. Elliott, Herdsman, I have also received much valuable assistance. He has carefully carried out the work planned and taken notes on the results of the experiments conducted in the feeding of cattle and swine. Accurate work has also been performed by Mr. Wm. Ellis in testing the vitality of seeds, the propagation of plants and the taking of the meteorological records. The employees also of the farms in every branch of the work have discharged their several duties faithfully and well.

WM. SAUNDERS,
Director Experimental Farms.

REPORT OF THE HORTICULTURIST.

(JOHN CRAIG.)*

DR. WILLIAM SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I beg to submit a report of some of the work carried on by the Division of Horticulture of the Central Experimental Farm for the year 1897, being the eighth annual report which I have had the honour to prepare.

I have found it impossible to condense into the limited space available, a full account of the work of the year. Some of this has been cumulative in results, the work being carried on for a term of years and culminating this season. This is particularly true of two lines of research, viz., methods of root grafting as affecting the health and vigour of the resulting tree, and the results of experiments with native and American plums. Both topics would require a considerable space to do them justice, besides a generous amount of illustration.

Blossoming Records.—The work of recording the blossoming period of our leading varieties of large and small fruits throughout the Dominion has again occupied my attention, and has been carried on with the kind assistance of interested fruit growers. The names of these recorders appear at page 101, Report 1896. The work of compiling these records and of reducing them to intelligible and useful form is very great, and it has been found impracticable with the assistance at hand to prepare the data in time for this report.

Fruit Crop.—As expected the crop of apples throughout the Dominion this year was small, after the phenomenally large yield of last season. Not only was it small as to quantity, but the quality of the product was much below the average—chargeable chiefly I may say to the laxity of growers in putting into practice those principles of fruit culture now so well understood, viz., the necessity of fertilizing adequately, pruning carefully, and spraying perseveringly.

TEST ORCHARDS AT THE CENTRAL FARM.

Apples.—These are planted out in two separate blocks. No. 1, contains a collection of named American varieties including a number of others of more remote introduction from Europe. This has been commonly designated the "Standard" orchard, including as it does those varieties which on account of general adaptability have become "standards" the country over. In it is contained a block each of Wealthy, Duchess and Tetofsky apple-trees. The first variety has been used as a top-grafting stock since 1891. There are now a large number of varieties among these top-grafts new to Canada and approaching fruiting age. The lines separating "hardy" from "tender" apples are quite closely drawn at Ottawa. Leading varieties of Western Ontario like King, Northern Spy and Greening are entirely unreliable on their own stocks in the Ottawa Valley. Experiments

* Resigned, November, 1897.

in top-grafting have been planned with a view of ascertaining the effect—if any—of hardy stocks upon doubtfully hardy scions. For this purpose considerable space in the "Standard" orchard has been given to trees of Haas (*Gros pommier*, *Fall Queen*), Gideon, McMahan White, and Hibernal; all vigorous growing trees and promising stocks. These will be ready for top-grafting next spring.

Apple Orchard No. 2, commonly known as the "Russian" orchard has been devoted to the testing of varieties of apples imported directly or indirectly from East Europe—principally Russia and Germany. Frequent references to these apples will be found in my preceding reports. Among them are a number of useful fruits, notably *Pointed Pipka*, *Switzer*, *Romna* and *Winter Arabka.*

Seedling Apple Orchard.—About 50 trees fruited this year. They were all Russian seedlings. The fruits were described and the trees numbered and labelled. None of those fruiting this year appear to be worthy of propagation.

Pear Orchard.—The soil of the pear orchard, a cold light sandy loam, is unsuitable to the growth of this fruit. The trees have been destroyed by blight and winter killing in large numbers each year. Particulars of the varieties on trial including those which have succumbed to blight and winter injury appear at page 136, Rep. 1896. Flemish Beauty is the only American variety that has borne fruit thus far, though the tree is not strictly hardy. Bessemianka, Gakovka, Lemon, Tonkovietka and Sapieganka, Russian pears, are perfectly hardy but blight badly. The fruit also is very poor in quality and exceedingly perishable.

Plum Orchard.—None of the *Prunus domestica* class have been entirely successful upon their own roots or upon the Myrobolan stock. The collection of American seedlings is now very large. It has been found that seedlings of *P. Americana* make the best propagating stocks for the descendants of *P. domestica*, *P. angustifolia* and for the named varieties of *Americana*. Provision has been made in this orchard for extensive top- and stock-grafting experiments. Among the valuable varieties of American plums are: Stoddard, Hawkeye, Yosemite Purple, Cheney and Hunt.

Cherry Orchard.—The serious injury wrought to this orchard two years ago by root killing has been duly noted. It has been observed that those trees propagated in 1891 upon "Bird cherry" stock, *Prunus Pennsylvanica*, have thus far escaped root damage by frost. These trees have been thrifty and healthy and this season bore a small crop of fruit. Bird cherry, sprouts, but not more freely than the Mazzard type. A number of each variety of cherry trees in the orchard have been propagated upon this stock, are in nursery now and will be ready for planting out next fall.

MEETINGS ATTENDED.

I was present by invitation and gave addresses during the year at the following horticultural meetings:—

Nova Scotia.—Colchester County Fruit Growers' Association, Truro, 19th January. Nova Scotia Fruit Growers' Association, Wolfville, 22nd and 23rd January.

Quebec.—Pomological Society, Howick, 27th and 28th January. Pomological Society, Stanstead, 17th and 18th August.

Ontario.—Napanee Horticultural Society, 15th February. Deseronto Horticultural Society, 16th February. Picton Horticultural Society, 17th February. Trenton Horticultural Society, 18th February. Smith's Falls Horticultural Society, 23rd February. Lindsay Horticultural Society, 24th February. Port Hope Horticultural Society, 25th January. Cobourg Horticultural Society, 26th February. Leamington Horticultural Society, 13th April. Olinda Horticultural Society, 12th January. Lincoln and Wentworth Fruit Growers' during August.

I was present by invitation at the meeting of the Vermont State Horticultural Society, Grand Isle, in September: also attended officially the meeting of the American Pomological Society in Columbus, Ohio.

Acknowledgments.—I am again deeply indebted for valuable technical assistance rendered to this Division during the year, to the following eminent scientists:—Mr. J. Dearness, Inspector of Schools, London, Ont.; Dr. W. T. Connell, Pathologist of Queen's University, Kingston, Ont.; Dr. B. D. Halsted, Experiment Station, New Brunswick, N.J.; Prof. B. T. Galloway and Dr. Erwin T. Smith, of Pathological Division, Dept. of Agriculture, Washington, D.C.; Prof. L. R. Jones, Experiment Station, Burlington, Vt.; Prof. A. D. Selby, Experiment Station, Columbus, Ohio.

To the *Fruit Growers of Canada* I wish to tender my warmest thanks for their generous help whenever called upon, and for their kindly appreciation of my efforts put forth in the interests of the fruit industry of this country.

DONATIONS.

I beg gratefully to acknowledge the following donations received during the year:—

Sender.	Donation.
Agricultural College, Guelph, Ont	Plants of new varieties of strawberries.
Bartlett, J., Oshawa, Ont	Vegetable seeds.
Brodie, R., St. Henri, Que	Cherry scions.
Bustin, Wm., Belleisle, N.S	Apple scions.
Closson, Bros., Highland Creek, Ont	Cuttings of Ruby currant.
Cone, E. W., Wisconsin	Patrick strawberry plants.
Dempsey, W. H., Trenton, Ont	Scions, apples and pears.
Evans, A. A., Kingsey, Ont	" yellow choke cherry.
Experimental Station, Burlington, Vt	" apple, plants Prunus Besseyii.
" Geneva, N.Y	Hunn, strawberry plants.
Fairfield, F. S., Orono, Ont	Seedling plums; cherry scions.
Fisher, M. J., Maxville, Out	Scions, apple.
Glass, A., St. Catharines, Ont	Seedling strawberries.
Graham, J. I., Vandeleur, Ont	Scions, apple.
Horton, E. L., Port Steamburg, N.Y	Seed beans.
Harsant, T. A., Glen Orchard, Muskoka	Seedling raspberries.
Iowa Agricultural College, Ames, Ia	Apple, pear and plum trees.
Mugnier, J. B., Albertine, N.B	Scions, apple.
Mowbray, W., Sarnia, Ont	" "
McFarlane, D. H., Pictou, N.S	Scions, plum.
McCallum, Dr., Smith's Falls, Ont	" apple.
Morden, J. A., Hyde Park, Ont	" "
MacKombir, J. T., Grand Isle, Vt	Plants, raspberry, grape cuttings.
Nichols, Rob., Mitchell, Ont	Seedling grapes.
Porter, F. W., Mt. Forest, Ont	Raspberry plants.
Read, M. A., Port Dalhousie, Ont	Hybrid grape and raspberry plants.
Stead, A. H., Tapley's Mills, N.B	Scions, pear.
Stephens, C. L., Orillia, Ont	Seedling, gooseberry.
Stevenson, Wm., Guelph, Ont	Strawberry plants.
Steele, Brigg's Co., Toronto, Ont.	" "
Sewell, W. W., Carthage, Ind	" "
Trotter, R., Owen Sound, Ont	Scions, Baker prune.
Waters, J. M., Fernhill, Ont.	Raspberry plants.
Yeisley, Chas., Lisbon, Ia	Scions of apples.

I have the honour to be, sir,
Your obedient servant,

JOHN CRAIG,
Horticulturist.

December 2, 1897.

SMALL FRUITS.

SEEDLING BLACK CURRANTS.

The following seedling black currants have been under my observation during the past seven years. They have been propagated in a small way, and have been tried in different situations on the Central Farm. They have also been sent to the branch farms and to some of the leading Canadian small fruit growers.

After these trials I feel justified in expressing the opinion that they are worthy of introduction. They, with 15 others, were selected in 1893, after four years' fruitage, out of more than 100 seedlings which had been under test at the Central Farm since 1887. Since that time they have maintained their individual points of excellence, and each one described is, I believe, superior to any other named commercial variety of the same season. They were originated as follows:—

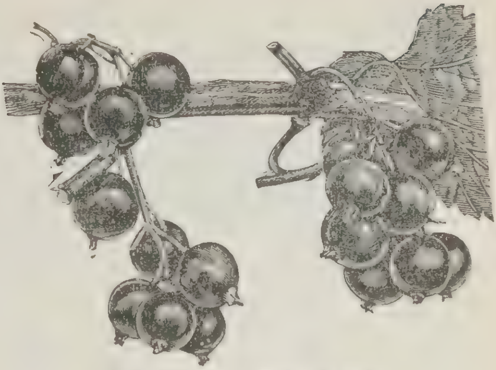
About the year 1879 a considerable number of seedling black currants were grown in London, Ont., by Dr. Wm. Saunders, the present Director of the Experimental Farms, from extra large selected berries of the Black Naples. One of these seedlings produced very large fruit of good quality, and the bush was productive. In 1884 several hundred seedlings were raised from large berries of this seedling, then known as Saunders' Seedling, but subsequently lost. When Dr. Saunders removed to Ottawa in 1887 to organize the system of experimental farms in Canada he brought with him from his experimental gardens in London about 150 of the most promising of these seedlings. By discarding from year to year all those of less promise they have been gradually reduced to the number stated.

DESCRIPTION OF VARIETIES.

BEAUTY.—Half natural size.

Beauty.—Plant, a strong uniform grower; berries, above medium; skin, thin, free from astringency; quality, good; bunches, large; berries refuse to separate easily from the pedicel. In gathering, it is best to pull the entire bunch, rather than attempt to pick the berries individually in the ordinary way. Field Note.—Ripe, July 13, 1896. Still holding to the bush, August 10, 1896. This year it ripened July 18, and was picked August 3.

Standard.—Bush, low spreading, fairly vigorous; bunch, medium size; berries, medium to large, round; skin, thin; flavour, pleasant, brisk acid. Ripe, July 3, 1896; July 10, 1897. Very productive.



STANDARD.—Half natural size.

SUCCESS.—Half natural size.

Success.—Bush, a medium grower; cluster, large; berry, medium to large; skin, firm but thin; quality, best; season, the earliest in the collection. This, with its productiveness, are its strong points. This variety was distributed in a limited way, through the Fruit Growers' Association of Ontario, three years ago. Many favourable reports have been received concerning its behaviour under varying conditions.

The four varieties following have not, one year with another, proved equal to the three above, but are all superior to *Lee's Prolific* and *Black Naples* in regard to size, quality and productiveness.

LEE'S PROLIFIC.—Half natural size.

BLACK NAPLES.—Half natural size.

Monarch.—Plant strong, vigorous; bunch, long, usually well filled; berries, medium size, ripen evenly in bunch; skin, thin; quality, good. Ripens among those of early mid-season. Very productive.

Climax.—Plant strong, vigorous. (No. 3 in row not true.) Bunch, large; berries, glossy; skin, thin, brisk subacid; quality, good. This is one of the latest, ripening with, or a little before Beauty. In productiveness it is one of the best.

CLIMAX.—Half natural size.

Star.—Plant, moderately vigorous, flat-topped; bunch, large; berry, of the largest size, round, glossy; skin, rather thick; flavour, a pleasant subacid; quality, best. The weak points of this variety are its time of ripening—mid-season—and its manner of ripening—rather uneven. It is not more uneven, however, than Lee's Prolific, and is much larger and finer in quality.

STAR.—Half natural size.

Winona.—Plant, a strong grower, upright in habit; bunch, above medium, long, well filled; berry large, round, clings well to pedicel; skin, thin, non-astringent; one of the most prolific, ripening with or a few days after the earliest. This variety is of the type of Monarch, but usually a few days earlier.

THE GOOSEBERRY PLANTATION.

The present collection of gooseberries was set out in the spring of 1893. It is composed of 10 American and 107 English varieties, beside a few of their hybrids. The soil is light sandy loam underlaid by limestone ledge and shale. Before setting the plants a portion of the area received a light surface dressing of blue clay. The ground was well manured before planting. The American varieties and hybrids were propagated by layers at the Central Farm. The English varieties were imported as two-year old plants. They were set in rows 4 x 6 feet apart. Cultivation was thorough. The plantation was mulched with barn-yard litter in the autumn of each year. No special winter protection was given. Two years ago the ground was heavily mulched with barn-yard manure; since then cultivation has been suspended, such weeds as appeared being pulled by hand. The English varieties have not been successful. A few have done fairly well and bear paying crops, but much the larger percentage have proved melancholy failures. This failure should, I believe, be largely credited to the character of the soil. In this locality and throughout the Ottawa valley gooseberries are not successful on the lighter sandy soils, but do well on the heavier soils. A clay loam is desirable—one that is rich, friable but not loose, and one naturally moist is preferable. A protected situation is also necessary—where the snow lodges early in the autumn and remains late in the spring. Unless the fruit grower of Eastern Ontario or the province of Quebec has such a situation and is also prepared to spend some time in spraying the plants to prevent mildew, I would not advise him to plant English gooseberries as a money making venture. He had better stick to the hardier American kinds, such as Pearl, Downing and Houghton. With the conditions as described above and within easy reach of a market, I believe this fruit may be grown profitably in many portions of Canada. There is now a market for considerable quantities of *ripe* gooseberries where formerly the gooseberry was not recognized as a dessert fruit in any uncooked condition.

It may be said that the indifferent success of the trials at the Central Farm gives but scant grounds upon which to base recommendations for their cultivation. I am speaking now, however, more on the strength of observations made elsewhere than upon our experience at Ottawa. The following table contains a list of the varieties on trial with notes regarding their health and hardiness. "Slight" means a very small amount of frost injury to the tips. "Little" describes a killing back of three or four inches. "Considerable" where killed back to two-year old wood. "Severe" shows that some plants have been destroyed by winter killing. "Health" refers to their relative immunity from mildew.

GOOSEBERRIES.

Variety.	Winter Injury.	Health 1 to 10 max.	Fruit.
Alcock's King	Slight	8	White?
Aston Red	"	9	Red.
Amber	Considerable	6	Yellow.
Admiration	"	5	Red.
Alma	Severe	7	
Antagonist	Slight	5	White.
Am. Seedling (Am.)	Hardy	10	Green.
Archville	Slight	7	"
Beauty	Considerable	8	Red.
British Crown	"	7	
Briton	"	7	Yellow.
Broom	Slight	9	"
Bank of England	Severe	4	?
Bright Venus	Considerable	8	?
Bumper	Slight	4	?
Crown Bob	"	8	Red.
Clayton	Badly	6	"
Champion Red			"
Conquering Hero	Little	8	"

GOOSEBERRIES—*Concluded.*

Variety.	Winter Injury.	Health 1 to 10 max.	Fruit.
Champagne	Considerable	6	White.
Columbus	Slight	8	"
Catharina	....	....	Yellow.
Compton's Bird Lime	Considerable	5	Green.
Companion	"	5	Red.
Ironmonger	Little	7	"
Imperial Red	Severe	6	"
Industry	Little	7	"
Keen Seedling	"	6	"
Keepsake	Considerable	7	Green.
King of Trumps	Slight	8	Red.
London	Little	9	"
Lord Derby	Severe	7	Green.
Lancashire Lad	"	6	Red.
Lancashire Gunner	"	7	?
Lomax Victory	"	5	?
Lily of Valley	Considerable	5	White.
Leader	"	6	Yellow.
Leveller	Little	7	"
Lady Houghton	Considerable	5	Green.
Lady Leicester	Little	6	"
Lancer	Considerable	7	White.
Napoleon le Grand	Severe	6	Red.
Marigold	Considerable	6	Yellow.
Mountain of Snow	Slight	8	White.
Moses	"	7	Red.
Mountain Seedling (Am.)	Hardy	9	"
Ottawa (hybrid)	"	9	Green.
Prince Regent	Severe	6	Red.
Peru	Slight	8	White.
Shiner	Severe	4	Green.
Souter Johnny	Considerable	3	?
Snowball	Little	6	White.
Snowdrift	Severe	7	"
Snowdrop	Slight	8	Red.
Smith's Imp. (Am.)	Hardy	10	Green.
Trumpeter	Little	7	Yellow.
Tally-ho	Severe	7	"
Transparent	"	6	"
Whinham's Industry	Considerable	6	Red.
Walnut	Little	6	White.
White Eagle	Severe	7	"
White Crystal (Am.)	Little	9	"
Whitesmith	Considerable	7	"
Wandering Girl	Slight	8	"
Yellow Sulphur	"	8	Yellow.

VARIETIES RECOMMENDED.

Red Jacket.—American but of English parentage; originated at London, Ont., by Dr. Wm. Saunders; received from George S. Josselyn, Fredonia, N.Y.; plant, fairly mildew free; berry, reddish-green, sometimes brightly tinged with red; size, $1\frac{1}{8}$ x $\frac{7}{8}$ inches; smooth, roundish oval; fair quality; ripe, Aug. 5, 1897.

King of Trumps.—English; from Wm. Fell & Son, Hexham, Eng.; mildews considerably, but is a vigorous grower; berry light red, spined; size $1\frac{3}{8}$ x 1 inch; slightly pyriform, sometimes oblique; firm, meaty, not high flavoured. This variety quite closely resembles A[illegible] Red.

London.—English; from Wm. Fell & Son; plant a strong grower; berry, dark red; pyriform; $1\frac{1}{4}$ x $\frac{3}{4}$ inch; flavour, sweet, pleasant; skin, thin; free from mildew.

Speedwell.—English; from Wm. Fell & Sons; a fair grower; berries pale red, sparsely spined, oval or pyriform; ripe Aug. 1; quality rather poor, productive.

Riccardo.—From same source as last named variety; a strong healthy grower; berries $1\frac{1}{2}$ x $1\frac{1}{8}$ inches; tinged with red; roundish oval or slightly pyriform; mildly subacid; ripe last week of July.

Among other better known varieties may be mentioned Crown Bob and Lancashire Lad. The two varieties of English gooseberries best known and most widely cultivated are Whitesmith and Industry.

Of American varieties Downing or Pearl undoubtedly stand at the head of the list. White Crystal has been very productive, but drops badly and is of poor quality.

LARGE FRUITS.

THINNING PEACHES AND PLUMS.

The importance of thinning peaches and plums during seasons of heavy yields is fully demonstrated by the results of the following experiment carefully carried out and clearly described by Mr. Martin Burrell, St. Catharines, Ont. The crop of peaches throughout the peach belt of southern Ontario last season was very large and the size of the average sample of fruit very small. No doubt the extremely hot weather of early summer was largely responsible for the small size of the fruit; again the usual period of high temperature characterizing the Crawford season had the effect of forcing the whole crop on the market very hurriedly. Prices went down to zero and poor fruit was an absolute drug. For a few days only the best grades brought in remunerative returns. Had the fruit been of good size it would have paid growers and buyers to have stored it a few days pending the clearing of the markets—as it was, a large proportion of the early Crawfords were sacrificed. The experiments conducted by Mr. Burrell for this division are therefore timely, and it is hoped that fruit growers will bear in mind the necessity of carrying out practices of this kind in these days of close competition.

With regard to thinning plums, though the results are not so marked as in the case of the peaches on account of the variety selected, there is no doubt that thinning Lombards is an absolute necessity, taking one year with another. If allowed to bear at will the tree overbears, the fruit soon becomes small and poorly coloured and will hardly pay the cost of picking, transportation and selling. The trees, too, break down and become debilitated. It is expensive work, but it will pay. The fruit should be thinned early in the season. Hand labour seems to be the only practicable method at present.

NOTES BY MR. BURRELL.

The thinning experiment on peaches were conducted on six-year old trees of the Hyne's Surprise variety, an almost free stone, white fleshed peach ripening between the season of the Early Rivers and the Yellow St. John. (10th to 25th Aug.) Three trees of each variety were selected as nearly alike as possible. The first was thinned on 22nd June, the second ten days later and the third left as a "check" tree. The thinning process was performed on the first tree when the peaches were quite small, between one-half and two-thirds of an inch from apex to base. On the second tree the peaches were from an inch to an inch and a quarter long. The fruit was picked as it ripened, three or four pickings for each tree. In the results appended "firsts" were 7 inches or more in circumference, and "thirds" were too small to be marketable.

PEACHES.

Tree.	Thinned.	No. Off.	Quarts.	Time.	Amount of Fruits in Lbs. and Number.				
					Firsts.	Seconds.	Thirds.	Total.	
				hrs.	Lbs.	Lbs.	Lbs.	No.	Lbs.
No. 1..	June 22..	1,500	11	$1\frac{1}{4}$	107	$75\frac{1}{2}$	2	1,290	$184\frac{1}{2}$
No. 2..	July 2..	800	16	1	$85\frac{1}{2}$	73	....	1,115	$158\frac{1}{2}$
No. 3..	Check....	....	....	....	20	$93\frac{1}{2}$	21	1,419	$134\frac{1}{2}$

With reference to the above figures it should be explained that the peaches under 'firsts' went about 6 to the lb.; the 'seconds' of trees No. 1 and No. 2 went about 8 to the lb., but in the case of No. 3 the sample was much smaller, going about 10 to the lb., and the 'thirds' about 15 to the lb.

At first sight it appears as if No. 1 tree ripened a great number of peaches considering the large number (1,500) that were taken off, but a considerable proportion of this 1,500 would not have 'set' and would shortly have dropped anyway. It must also be pointed that about 25 per cent more rot obtained on the 'check' tree, and had these extra rotten been counted, the total number on the 'check' tree would have been much heavier. It will be seen that on the thinned trees the gain, in size, was immense, and this is where the great commercial advantage lies. Had the trees been of a later variety with a longer season of ripening, the difference would probably have been still greater. In thinning, an endeavour was made to leave the peaches about two inches apart. I am convinced, however, that a much larger number could profitably have been taken off. The cost of thinning out trees of this size would amount to only from ten to twelve cents a tree. In conclusion, it may be urged from the above experiment, that, when a big crop of fruit is set, thinning peaches is a highly remunerative process for the following reasons:—

1. It increases the weight of yield.
2. It largely increases the size of the fruit.
3. It reduces the number of matured seeds, thereby considerably lessening the drain on the vitality of the tree.
4. It renders the crop less liable to 'rot.'

Some of the best Michigan and Georgia peach growers thin to six inches apart.

PLUMS.

Tree.	Thinned.	No. Off.	Quarts.	Time.	Lbs. of Fruit.	No. of Plums.	Size, No. to Lb.	No. of other Plums.
				Hrs.				
No. 1....	June 21..	3,000	7	$1\frac{1}{2}$	164	4,852	$29\frac{1}{2}$	645
No. 2....	July 3..	1,800	9	$1\frac{1}{2}$	145	4,900	34	114
No. 3...	Check....	....	....	....	*170	6,650	39	1,011

* 12 lbs. of this 170 consisted of inferior and unmarketable fruit.

In the thinning experiment conducted on plums three trees of "Moore's Arctic" were taken; an early variety of small to medium size. The crop was far too heavy even on the thinned trees. This fact and the dry weather during the growing season partially

accounts for the small size of the plums. Although the results with plums were not so marked as in the case of peaches, the evidence points the same moral. In both cases it will be observed that the early thinning bore the most profitable results, and it will manifestly pay to commence all work of this kind immediately after the fruit sets."

THINNING at C. E. F.

Variety.	When Thinned.	Number of Thinned Specimens in ½ bushel.	Weight, of ½ bushel Thinned.	Number Specimens in ½ bushel not Thinned.	Weight of ½ bushel not Thinned.
			Lbs. Oz.		Lbs. Oz.
APPLES—					
Krimskoe	June 17	109	22·	126	22· 8
Duchess	" 17	96	19·	123	18· 4
PLUMS—					
R. B. W. Seedling, No. 3	" 17	560	19·	640	18· 4

The above small experiment points the same moral and emphasizes the result obtained by Mr. Burrell.

APPLE STORING EXPERIMENTS.

Quite an extended series of trials were made last winter with a view of securing information regarding methods of storing apples in winter. Some of the points involved were (1) wrapped *versus* unwrapped fruit; (2) cellar *versus* ground floor storage; (3) close, *versus* ventilated packages. The experiments began in the autumn, were carried through the winter, the final examination being made July 29, 1897. Twenty-four varieties of apples were included in the trials. The results given below are averages:—

1. Wrapped *versus* unwrapped apples.

	Per cent. Sound.	Comparative weight. Scale of 100.
Wrapped and stored in cellar	42·	37
" store-room	36·	33
Unwrapped in cellar	32·8	29
" store-room	33·	23

Specimens wrapped in paper kept best, there were fewer rotten apples, and they lost least by evaporation. The ground floor store-room did not preserve them as well as the cellar.

CLOSE *versus* VENTILATED PACKAGES.

This was tested by packing equal quantities of six varieties of apples in boxes of the same make with, and without ventilation. Half of the cases were placed in the cellar the other half in the upper store-room.

Results.

Package.	Stored.	Per cent of fruit sound.
Not ventilated.	Cellar.	42
do	Store-room.	64·6
Ventilated.	Cellar.	49
do	Store-room,	45·8

The tight package preserved the fruit best in store-room, but not in cellar; per contra the ventilated did better in cellar than in storeroom.

GOOD KEEPERS.

1st. Class. *To April or later.*

Walbridge.	Lawver.	Scott's Winter.
Salome.	Sharp's Russet.	Ben Davis.
Rawles Janet.	Hartshorn	Thompson's 35.
Nodhead.	Swayzie Pomme Grise.	

2nd. Class. *To March.*

Watterson No. 3.	Golden Stone.
Ontario.	Pewaukee.
Flushing Spitzenberg.	Plumb's Cider.

3rd Class. *To February.*

Princess Louise.	Wealthy.	Haas.
McMahon.	Gideon.	Orange Winter.
Longfield.	Fameuse.	McIntosh.

ADDITIONAL NOTES ON COVER CROPS.

This subject was discussed somewhat exhaustively in the report for 1896. Several points of interest have presented themselves since that.

CLOVERS INJURED BY WINTER OF 1896–97.

The destruction of the clover crop by the severe weather of January, 1896, (without snow) was general throughout the Ottawa valley. *Mammoth Red* and *Common Red* were completely killed out in the Farm orchards. *Alfalfa* (*lucerne*) fared a little better, a small percentage of the plants showing vitality in the spring of 1897. It was noted that whenever the plots of Mammoth Red and Alfalfa over-lapped in the orchard that both varieties came through the winter better than when growing separately. Acting upon this hint, plots containing equal quantities of Alfalfa and Mammoth Red were sown last autumm. 6 pounds of each clover were used per acre and sown August 1st. The seed germinated uniformly and the plants made a strong growth which continued till the arrival of frosty nights. At this time the average height of the Alfalfa was 16 inches, and the Mammoth Red 10 inches. The one formed an appropriate complement to the other—the spreading stools of the Mammoth Red covering the ground with a thick mat beneath the more slender and taller growing Alfalfa.

Sowing the Seed.—It is wise for orchard cover purposes to use not less than 25 pounds of seed per acre.

The soil should be in an excellent condition as regards tilth—entirely free of weeds and lumps or clods of earth. The best time to sow the seed at Ottawa is between July 25 and August 5. At this time purslane or "pursley" (*Portulaca oleracea*) is the most troublesome orchard weed. If it has obtained a foothold, the best thing to do is to turn it under with a gang plough. Surface cultivation will not exterminate it but merely check its growth, and that only during dry weather. The clover seed may be sown satisfactorily with a hand broadcasting seeder. If the soil is

in a proper condition—that is, has been thoroughly harrowed—all that is necessary afterwards is to roll it. This should be done immediately the seed is sown as it germinates so quickly, under favourable conditions, that a late rolling often does more harm than good by crushing the tender sprouts.

Part of the farm orchard was not seeded down this year until August 10. This was too late to hope for the best results. The open autumn, however, gave unusual opportunities for late growth and a fair cover was secured though not equal to other parts sown 10 days earlier.

FURTHER EXPERIMENTS IN THE PRESERVATION OF GRAPE JUICE.

The experiments in connection with the preservation of grape juice detailed in the Report for 1896 (page 166–8) were continued with other antiseptics and by different processes again this season.

The juice of five varieties of grapes was used, viz., Clinton, Black Elvira, Bacchus, Brant and Concord.

Amount of juice from 100 pounds of grapes of each variety :—

	Gals.	Qts.
Clinton, 100 pounds	8	0
Black Elvira, 100 pounds	8	2
Bacchus, 100 "	7	1
Brant, 100 "	7	0
Concord, 100 "	7	0

Series I.

Heated to 160° for 10 minutes. Bottled December, 1896.

Variety.	Quantity.	How Treated.	Condition, November, 1897.
Clinton	1 pint	Sugar, 2 oz	Slight boiled flavour; fresh, palatable.
Bacchus	1 "	" 2 oz	Fresh, palatable.
Brant	1 "	" 2 oz	Slightly soured.
Concord	1 "	" 2 oz	Fresh, but juice lacks briskness.
Black Elvira	1 "	" 2 oz	Palatable, good.

Series II.

Heated to 150° for 10 minutes. Bottled December, 1896.

Variety.	Quantity.	How Treated.	Condition, November 1, 1897.
Clinton	1 pint	Sugar, 2 oz.; salicylic acid, ·175 grms	Fresh, palatable; good flavour and condition.
Bacchus	1 "	Sugar, 2 oz., sal. acid ·175 grms	Milder than last, pleasant.
Brant	1 "	Sugar, 2oz., salicylic acid, ·175 grms	Juice light red in colour, pleasant flavour.
Concord	1 "	Sugar, 2 oz., sal. acid, ·175 grms	Muddy, flavour fair; no fermentation.
Black Elvira	1 "	Sugar, 2oz., salicylic acid ·175 grms	Mouldy, not in good condition.

Series III.

Bottled cold, December, 1896.

Variety.	Quantity.	How Treated.	Condition, November, 1897.
Clinton	1 pint	Formalin, 4·8 c. c., 1%; sugar, 2 oz.	Unfermented, flavour unpleasantly pungent.
Clinton (A).	1 "	Formalin, 2·4 c. c., ½%; sugar, 2 oz	Unfermented, very dark, flavour disagreeable.
Bacchus	1 "	Formalin, 4·8 c. c., 1%; sugar, 2 oz.	Same disagreeable astringent after-taste.
Bacchus (A).	1 "	Sugar, 2 oz.; formalin, ½%	Unpalatable.
Brant	1 "	Formalin, 1%; sugar, 2oz.	Fermentation had not taken place in any case, but each sample was characterized by an unpleasant pungent burning after-taste, undoubtedly caused by the formalin.
Brant (A)...	1 "	Formalin, ½%; sugar, 2 oz.	
Concord	1 "	Formalin, 1%; sugar, 2 oz.	
Concord (A).	1 "	Formalin, ½%; sugar, 2 oz.	
Black Elvira	1 "	Formalin, 1%; sugar, 2 oz.	
B. Elvira (A)	1 "	Formalin, ½%; sugar, 2 oz.	

Series IV.

Heated 10 minutes at 130° on two consecutive days. Bottled December, 1896.

Variety.	Quantity.	How Treated.	Condition November, 1897.
Clinton	1 pint	Sugar, 2 oz.............	Fermented.
Bacchus	1 "	" 2 oz.............	"
Brant	1 "	" 2 oz.............	"
Concord	1 "	" 2 oz.............	"
Black Elvira	1 "	" 2 oz.............	"

Series V.

Heated 10 minutes at 160°. Bottled December, 1896.

Variety.	Quantity.	How Treated.	Condition, November, 1897.
Clinton ...	1 pint	Without sugar..........	Fresh, unfermented; rather acrid.
Bacchus	1 "	"	" brisk, pleasant acid, good.
Brant	1 "	"	" " palatable.
Concord	1 "	"	Rather insipid, unfermented.
Black Elvira	1 "	"	Fresh, acid slightly astringent.

Series VI.

Not heated. Bottled December, 1896.

Variety.	Quantity.	How Treated.	Condition, November, 1897.
Black Elvira	1 pint ..	Formalin, ½%; sugar, 2 oz.	Unfermented, unpleasant flavour.
" (A)	1 "	" ½%....	Slightly fermented.
Clinton	1 "	" ½%; sugar, 2 oz.	Fairly good, unfermented.
Clinton (A).	1 "	" ½%.....	Disagreeable, flavour pronounced.
Bacchus	1 "	" ½%; sugar, 2 oz.	Unfermented, but unpleasant.

SERIES VII.

Heated 10 minutes at 170°. Bottled December, 1897.

Variety.	Quantity.	How Treated.	Condition, November, 1897.
Clinton	1 pint	Sugar, 4 oz	Sweet, pleasant, palatable, unfermented.
Black Elvira	1 "	" 4 oz	Astringent, unfermented.

DEDUCTIONS.

1. Formalin while a proved ferment arrester imparts such a disagreeable flavour to the juice that it cannot be used, at least as strong as in the proportion of $\frac{1}{4}$ per cent.

2. Sugar added to the juice with formalin masked the flavour of the latter somewhat, but did not obliterate it entirely.

3. Salicylic acid, ·175 grammes with 2 ounces sugar to each pint produced the most palatable beverage.

4. Samples were successfully preserved when heated for 10 minutes at 160°, with sugar at the rate of 2 ounces to each pint of juice. Duplicate samples without sugar were also successfully preserved but were not generally as palatable as the former.

5. 160° Fahr. seems to be the lowest safe temperature that may be used in the preservation of grape juice. The juice may be held at this temperature for 15 or 20 minutes without imparting to it any unpleasant boiled flavour.

SPRAYING.

The apple orchards on the Central Farm were sprayed four times with Bordeaux mixture and Paris green. As a result of this work it was difficult at harvesting time to find an imperfect specimen of fruit. Even such varieties as McIntosh Red and Lawver were almost entirely free from "apple spot." The formula used was that recommended by this division for the past four years, viz.: 4 pounds each of copper sulphate and lime to each barrel of water. Paris green was always added at the rate of 4 ounces to each barrel of the mixture. This did not entirely prevent injury from codling moth, but undoubtedly lessened the loss from this source very materially. In addition to this standard fungicide, Lysol—a substance mentioned in last year's report—and formalin, a new antiseptic, were tried with the following results.

Lysol.—Reference was made to this substance in the annual reports of 1895–96. It was strongly recommended as an insecticide and fungicide by some German horticulturists. The results secured here do not corroborate these reports, and no good reason can be shown why it should be recommended as a fungicide, though it is but fair to add that last year's work warranted a claim being made for its usefulness as an insecticide. The experiments of this season did not show that it promised qualities superior or equal to the present standard insecticides.

1. Four ounces to 5 gallons water, equal to $\frac{1}{2}$ per cent solution on Duchess apple trees. Three applications did not give marked results. Foliage and fruit were normal and healthy. The crop of apples on these trees was too small to allow of reliable comparison being made.

2. Eight ounces to five gallons of water equal to 1 per cent solution; foliage healthy; fruit somewhat gnarled. The gnarly appearance was noticed soon after the first application.

3. Twelve ounces to five gallons equal to $1\frac{1}{2}$ per cent solution. Foliage continued healthy throughout the season. The fruit on one tree was fairly sound and clean, on the other it was badly deformed and rusty. This seemed justly attributable to the Lysol. Further additional reference to this substance will be found in connection with the peach spraying experiments.

Formalin.—This antiseptic and preservative was tested as a fungicide on Duchess apple trees in the following strengths:—

4. One ounce to five gallons of water. Foliage was not affected injuriously; fruit clean. Aphides present on foliage were not killed.

5. Two ounces to five gallons. This had no perceptible injurious or beneficial effect upon foliage or fruit. Aphides did not seem to be disturbed.

9. Four ounces to five gallons.; no injury to foliage. Three pecks of apples picked, only four specimens wormy. Check trees were wormy to the extent of 8 to 10 per cent only. This would seem to indicate that formalin possessed some deterrent influence against codling month.

BORDEAUX MIXTURE WITH PARIS GREEN *vs.* PARIS GREEN IN WATER.

This question is often asked: Is Paris green as efficacious against codling moth when used with Bordeaux mixture as when it is applied by itself? Careful experiments carried on in 1895 and 1896 answered the question in the affirmative. The experience of this season corroborates that of former years. Paris green was used in both cases at the rate of one pound to 160 gallons of fluid. Three applications were made. When applied in water alone considerable injury resulted to the foliage of the Tetofsky apple trees under experiment. No injury was noted in the case of other trees treated three times with Bordeaux mixture and Paris green. As to effects on codling moth larvæ a Transcendant crab tree sprayed with Bordeaux mixture and Paris green yielded five bushels of fruit. Of these, nine specimens only were wormy; one Hyslop treated as above, yielding three and one-quarter bushels, gave thirty-six wormy specimens.

PARIS GREEN AND WATER.

One Jumbo crab tree yielding one and one-quarter bushel gave five wormy specimens.

One Orion crab tree yielding one bushel gave fourteen wormy specimens.

It will be noted that the proportion of wormy apples is small in both cases and does not point to important practical differences. It is my opinion that it would not pay a fruit grower to incur the expense involved in making a separate application of Paris green in view of the very doubtful benefit derived.

BORDEAUX MIXTURE—SIX POUNDS OF COPPER SULPHATE *vs.* FOUR POUNDS.

Some horticulturists advise the use of six pounds of copper sulphate with four pounds of lime to each barrel of water in making Bordeaux mixture. This formula has in one or two instances given better results when used against potato rot, than formula 4:4. In combating diseases of fruit trees its advantages have never been apparent to me. If four applications are made, many varieties of apples will be more or less russetted by the 6:4 formula (See Rep., 1896, p. 174), and during seasons of heavy precipitation the foliage may suffer injury.

A careful comparison was made this year of the two formulas when applied to heavily laden crab trees. With the 4:4 formula the foliage and fruit were healthy and clean throughout the season. No injury to the leaves was observed, while with the 6:4 formula all the fruit was distinctly russetted and the foliage slightly scorched. In the case of a Quaker Beauty Crab part of the fruit was rendered unsalable. The number of wormy specimens in both series was about the same.

ARSENATE OF LEAD.

The experiments with this insecticide commenced in 1895, continued in 1896, were again carried on this year. The results would seem to indicate that it is an effective remedy against codling moth. The insecticide was made by dissolving one-half of an ounce of arsenate of soda in one quart of water, three-quarters of an ounce of acetate of lead in an equal quantity, then pouring the two together and diluting with water, to five gallons. This mixture sprayed three times on two trees of Orange crabs yielding five bushels, gave an average of five wormy specimens in each bushel.

ARSENATE OF LEAD WITH BORDEAUX MIXTURE.

The above formula was used in connection with Bordeaux mixture, 4 : 4 formula replacing Paris green. One tree each of Jumbo and Ball's Winter crab apples were selected. Three applications were made. The result was disastrous to both foliage and fruit. The former was badly scorched, while the latter was rendered entirely unfit for market on account of the skin bearing deep patches of russet besides numerous blotches and cracks. The number of wormy specimens averaged four to each bushel of fruit. Check trees standing alongside were healthy and normal, so that there seems no reason to doubt that the corrosive and injurious action was due to some unfavourable combination of the insecticide with the fungicide. In former experiments this injurious effect was not noted.

TABLE showing per cent of Sound and Wormy Fruit obtained by the different mixtures.

Mixture.	Handpicked.		Windfalls.		Handpicked and Windfalls.
	Per cent Sound.	Per cent Wormy.	Per cent Sound.	Per cent Wormy.	Per cent Wormy.
1 Lysol ½ per cent sol...............	97·2	2·8	92·2	7·8	10·6
2 Lysol 1 per cent sol	92·7	7·3	80·	20·	27·3
3 Lysol 1–1½ per cent sol................	96·3	3·6	93·9	6·1	9·7
4 Formalin ⅛ per cent sol.....	100.	....	94·1	5·9	5·9
5 Formalin ¼ per cent sol.............	98·9	1·1	85·	15·	16·1
6 Formalin ½ per cent sol	96·9	3·1	95·3	4·7	7·8
7 Bordeaux 4 : 4 Paris green..........	99·2	·8	98·9	1·1	1·9
8 Paris green	100·	....	99·5	·5	·5
9 Bordeaux 6 : 4 Paris green..........	99·7	·3	99·2	·8	1·1
10 Paris green.........................	98·8	1·2	99·6	·4	1·6
11 Arsenate of Lead.	99 3	·7	98·8	1·2	1·9
12 Bordeaux mixture, arsenate of lead..	100·	....	99·	1·	1·
13 Checks............................	92·	8·	89·	11·	19·

SPRAYING EXPERIMENTS AT ST. CATHARINES.

(Superintended by Martin Burrell, Esq.)

Object of the experiment :—To prevent peach leaf curl, rot of the fruit of peach and plum, and orange rust of the quince.

Lysol of three strengths was used : (1) ½ per cent (2) 1 per cent, and (3) 1½ per cent. (4) Copper sulphate, 2 lbs. to 25 galls. of water for first application followed by Bordeaux mixture. (5) Bordeaux mixture, 3 : 3, 40 gallons. The first application was made on Apr. 17, when the peach buds were beginning to swell. The 2nd on May 22, 3rd on May 26 (repeated on account of rain), 5th on June 12, 6th on July 10.

RESULTS.

Lysol on peach trees. (1) ½ per cent. Effect on foliage: Twig blight (Monilia) was not arrested; leaf curl was abundant. Effect on fruit: No perceptible benefit. (2) 1 per cent; foliage, considerably "curled" and blighted. Fruit, an average amount of rot. (3) 1½ per cent; foliage, less affected by curl than No. 1 and 2. Twig blight in evidence. Fruit fairly sound. (4) Copper sulphate and Bordeaux mixture. The trees in this row developed yellows and were destroyed before harvesting time. (5) Bordeaux mixture 3 : 3 lbs., 40 galls., and Paris green, 3 oz. Foliage, five trees out of the six in this row were practically free of curl leaf. Twig blight caused by Monilia appeared here and there, no injury to the foliage was noted as an effect of the spray. Fruit almost free from rot. (6) Bordeaux mixture, 4 lbs. copper sulphate. 8 lbs. lime, 4 oz. Paris green. Four applications beginning May 22. This formula was compared with No. 5. At the time of the first application "curl leaf" had already developed and was not obviously checked by the spray. (7) Check row: badly affected by curl leaf; considerable blight.

Lysol was also used on *plum* trees, but without any apparent benefit 1½ per cent; solution injured the leaves slightly. On *quinces* it did not prevent the development of orange rust. Having tried this substance for three years with unsatisfactory results, there does not seem to be any good reason for retaining it longer among the list of insecticides and fungicides used as sprays.

Mr. Burrell makes the following observations:—

"In regard to the experimental work of spraying peach and plum trees to prevent curl leaf and rot, although you have the details, I might say that the season throughout was unfavourable for the successful application of the mixtures, frequent showers and rapid changes of temperature creating unusual and somewhat difficult conditions. Unfortunately, too, the disease of "yellows" appeared on several of the trees in one of the treated rows; these trees were of course promptly cut out and burned. While the spraying was not so effective as might have been desired against the peach curl and monilia, some good was accomplished; the fruit on the trees sprayed with the Bordeaux mixture being from 15 to 25 per cent freer from rot than on the unsprayed trees. The Lysol was not noticeably effective either as an insecticide or as a fungicide. The 1½ per cent solution (6 oz. to 10 galls.) was slightly injurious to the foliage. At this strength some of the smaller green aphides were killed, but the half grown and mature lice were unhurt.

"The applications to the quince trees for the prevention of orange rust were not productive of any very marked results, as very little orange rust appeared this year on any quince trees.

"I may say, however, in gathering the quinces I observed that the foliage of the two rows sprayed (4 times) with Bordeaux mixture was much more glossy and healthy than that on the rest of the trees, and that the quinces were uniformly good. The row sprayed with 'lysol' was much the same as the two unsprayed rows, and in each case the foliage was less healthy than on the rows treated with Bordeaux mixture, and some slight indications of rust were noticed."

DEDUCTIONS.

Lysol.—Gave no marked results either as a fungicide or insecticide.

Bordeaux mixture 3 : 3 gave the best results in preventing peach curl, fruit rot and twig blight. This standard remedy seems most effective and is therefore recommended. Care should be exercised in preparing the mixture in order that injury to peach and plum foliage may not result. It is wise to use *fresh lime* only, and expedient to employ the ferrocyanide of potassium test before applying Bordeaux mixture to peach trees.

TREATMENT OF APHIDES IN THE ORCHARD.

It is not often that orchard trees under good cultivation suffer from the attacks of aphides. The summer of 1897 was marked by the most serious visitation of this little insect that I have known. Plum trees were severely attacked throughout Ontario and Quebec. Cherry trees in some instances lost their foliage in midsummer, while in bad cases the growth of vigorous apple trees was completely arrested in midseason. The attack began in spring with the unfolding leaf buds and was continued with more or less vigour till the leaves fell. Two weeks of fiercely hot weather in July and again towards the end of August retarded the increase somewhat, but the check was only temporary. Nursery stock and young orchard trees suffered most. The Farm orchards were sprayed four times to prevent injury from this little pest. Among remedies the following were tried :—

KEROSENE EMULSION (Riley-Hubbard formula).

Rolfe apple tree.—Applied June 15. Examined June 16. A few (about 10 per cent) of aphis killed. Sprayed again June 17. Examined June 19. About 20 per cent of aphis killed. Leaves of tree quite rusty ; considerably injured by spray.

Rubicon apple tree.—Sprayed June 28. Examined June 29. Not more than 10 per cent killed ; foliage slightly spotted. Sprayed again July 3. Examined the following day. About 50 per cent of aphis killed ; foliage considerably injured.

Borsdorf apple tree.—Sprayed June 28. Examined June 29. About 80 per cent of aphis killed. Foliage badly injured. Sprayed again July 3. Examined July 5. Aphis nearly all dead, but foliage badly injured.

In every case where kerosene emulsion was used two or more times, the foliage was considerably injured although every care was exercised in preparing and applying the emulsion. For this reason other insecticides were tried.

TOBACCO WATER.

Made by soaking 8 lbs. of home grown tobacco leaf and stems in a barrel of water for 48 hours with 2 lbs. of soft soap added, applied to *Scotts Winter*. Three applications completely cleared the tree.

Rolfe apple tree.—Treated June 25. Examined June 26. About 50 per cent of aphis killed. Sprayed again June 26. Examined June 28. No living insects visible.

Fanny apple tree.—Treated on June 24, and again on the 26th. Examined June 28. A few colonies were found upon twigs that were not thoroughly sprayed.

Ordinary tobacco waste did not give satisfactory results. Three sprayings of tobacco water made from this material only killed about 50 per cent of the insects upon a Rubicon apple tree. The efficacy of this brand was increased by soaking the stems in hot water. One application destroyed about 95 per cent.

A tree of the *Peter apple*, sprayed once with tobacco decoction prepared as just described, was cleared of aphis on July 14, by one application.

TOBACCO WATER AND LEMON OIL.

One half pint of lemon oil was added to five gallons of water. This was applied to a badly infested *Scotts Winter* apple tree. A single application completely ridded the trees of aphis. The foliage and young wood were somewhat discoloured, but did not appear to be injured.

QUASSIA CHIPS AND WHALE OIL SOAP.

To prepare :—Quassia chips, 4 lbs., boiled $\frac{1}{2}$ an hour in 4 gals. water. Whale oil soap, 2 lbs., stirred in. Diluted to 1 barrel or 45 gals. water.

Ruby Gem apple.—Sprayed on July 14. Examined July 16. About 90 per cent of aphis dead.

Glowing Coal apple.—Sprayed July 14. Insects all dead where leaves were not tightly curled. Other trees treated at the same time showed about the same results. Very much depended upon the thoroughness of the application. This held good all the way through.

SUMMARY.

1. For ease of preparation, cheapness, and efficacy against aphides tobacco water with soft soap or whale oil soap is recommended for general orchard use.
2. Tobacco water and lemon oil gave the most decisively satisfactory results. The lemon oil more than doubles the cost of the preparation which, without it, is less than one half cent per gallon.
3. Quassia chips and whale oil soap make an insecticide rather more expensive than the last and nearly as effective.
4. In spraying to destroy aphides the greatest possible care ought to be exercised in order that the liquid should reach every part of the lower leaf surface.
5. Two or three applications at intervals of a few days should be made in order to destroy the colonies escaping the first spray.

FUNGOUS DISEASES.

The year was marked by the vigour and activity of many of the fungous diseases parasitic on cultivated plants.

Apple spot (*Fusicladium dendriticum*, Fckl.) was phenomenally virulent upon the foliage of apple trees. This may be accounted for by the favourable climatic conditions for its growth, prevailing during the latter part of June and the greater portion of July. It is a regrettable fact that many growers omitted spraying their orchards this year on account of the small crop of fruit. This is bad policy and will not pay in the long run. Many orchards were partially and some completely defoliated in midsummer. So severe was the attack that growers in certain sections thought a new kind of blight had struck their orchards. It was, however, only an old enemy in new guise. Even orchards sprayed most carefully were not exempt by any means, but they were vastly superior in vigour of foliage to those not sprayed. Several cases of plum spot (*Cladosporium carpophilum* v. Thümen) affecting *apricots* were noted. In one instance the fruit was entirely destroyed. *Native plums* where not sprayed were again severely attacked. Owing to this cause not more than one-quarter of a crop was harvested in the Ottawa valley where this type of plum is largely grown. The native plum crop on the Central Farm was fair as to quantity and good as to quality. The trees were sprayed three times with Bordeaux mixture.

The season was also marked by a severe outbreak of the disease which so frequently injures Flemish Beauty pears, variously known as "pear cracking," "pear leaf blight," &c. (*Entomosporium maculatum*). *Numerous samples were received from widely separated sections showing the disease to be very general in its attack. Its presence in the orchard may be noted in early summer by the appearance of small black spots upon the leaves and smoky patches dotting the skin of the fruit. The leaf spots increase in size; the leaves turn yellow and fall in late summer; meantime the fruit spots have grown in size; invading the skin and assuming a horny external covering, they eventually check the growth of the pear causing uneven development, resulting in the growth of cracks in the skin and a general aborted and gnarled appearance.

Treatment.—Bordeaux mixture is invaluable in preventing the development of this disease. It is of little use if not applied as soon as the buds begin to swell. Four ap-

* It is probable that two or three distinct diseases are confused with the last named enemy. A bulletin upon this subject has recently been issued by the Cornell Experiment Station.

plications are necessary. It does not seem possible of late years to obtain a good sample of Flemish Beauty pears except with careful spraying.

Peach mildew appeared in a few orchards. This disease is superficial in habit of growth, causing grayish patches upon the fruit and covering the under side of the leaves and the bark of the young shoots with a powdery gray coating. It is often brought in from the south with young peach trees. If such trees develop the disease during the first season in orchard they should be discarded. Close pruning would undoubtedly check the growth of the disease, but it is unwise to begin orcharding with unhealthy trees. I have had no experience in spraying to prevent mildew, but see no good reason why standard fungicides should not be effective.

Shot hole fungus (Septoria pruni).—This parasite should rank among the first-class pests of the season. Many letters like the following were received. "Dear Sir :—What is the matter with the inclosed plum leaves? They are from Lombard's. The trees were planted five years ago, are in good sandy ground and have been well cultivated." Henry Shaw, Waterville, N.S. "Shot hole fungus" is readily recognized in its later stages by the small, neatly cut, circular perforations surrounded by a purplish ring which so plentifully mark affected leaves. It is a serious enemy to plum culture. Whenever a plum tree is enfeebled by uncongenial soil, the attacks of borers, or the effects of climate, shot hole fungus is nearly certain to appear. In cases of severe attack the tree loses its foliage prematurely. This prevents the fruit from ripening, the proper development of leaf and fruit buds, bringing about generally disastrous results.

Remedial.—If the trees are sprayed to prevent plum rot (*Monilia fructigena*), Septoria will also be largely prevented. The trouble is, that growers do not think it necessary to spray young trees not in bearing. Healthy foliage is essential to the proper storing of the leaf and fruit buds, and unless this is secured by spraying assisted by good cultivation, success will not be attained.

Grape mildew (Peronospora) was not so injurious as might have been expected on account of the character of the season, and yielded in the Farm vineyard to the persistent application of Bordeaux mixture.

GOOSEBERRY MILDEW.

This has been the chief difficulty met with at the Central Farm in the cultivation of the English gooseberry. The plantation is situated on light sandy loam. Although carefully sprayed each season there has always been present a certain amount of mildew. This combined with frost injury has rendered most of them unproductive. For further particulars (as to susceptibility of varieties) see notes on Gooseberries.

An experiment in shading the plants from the sun's rays by growing a hill of corn on the south, east and west sides was tried. The seed of a medium growing variety of corn was planted on the sides indicated, about two feet from the gooseberry plant.

Three plants each of the following varieties of gooseberries were shaded, viz., Snowball, Lady Leicester, Marigold, Conquering Hero, Fillbasket and Riccardo. (Notes taken Sept. 30.)

Results.

Scale 1 : 10. Healthy, 10. Badly diseased, 1.

Date, 1897.		Shaded.		Not shaded.
Aug. 16—Snowball	8	plants growing	6	not growing.
do Lady Leicester	7	do	7	growing.
do Marigold	7	fair condition	5	very sickly.
do Conquering Hero	5	poor condition	6	fair condition.
do Fillbasket	9	good condition	7	fair condition.
do Riccardo	10	healthy	9	good condition.

With one exception the plants protected by the growth of corn were healthier than plants of the same variety not so protected. These results should only be regarded as indicative and not conclusive. The experiment should be repeated on a larger scale another year on the same plantation. With regard to fungicides. Bordeaux mixture was applied in the forepart of the season—later when this began to stain the fruit, a weak solution (1 pound to 160 gallons) of copper sulphate was applied. This proved fairly effective. Weekly applications were necessary, however, in order to hold the disease in check. It seemed quite as effective as ammoniacal copper carbonate, is much easier prepared and exceedingly cheap. It is best to have a concentrated solution on hand which may be diluted as needed.

Fungus *(Heterosporium gracile,* Sacc.)

Many species of Iris in the perennial border were severely attacked by the above named fungous disease. It is first noticed by the presence of circular yellow spots upon the foliage. These spots increase in size and number; the leaves wither and the flower stalks fail to develop, or wither in the act of flowering. At this stage, if the plant is pulled up the bulb will in most cases be found to be affected with a soft rot resembling very much the crown rot which so frequently destroys celery in winter. This disease develops and spreads rapidly in cool moist weather, such as characterized the month of July. It usually appears in the first half of June, its later development depending upon temperature and moisture. The German Iris section appears to be more susceptible to the disease than other types. This parasite is a serious drawback to the cultivation of the Iris.

Treatment.—Bordeaux mixture was used with apparently good effect, although no exact comparisons were made. When plants are badly diseased it is wise to dig them up and burn them. In the case of a badly infested bed it is advisable to remove the healthy plants to new ground and use the old ground for some other class of plants.

A DRY ROT OF APPLES.

A preliminary note regarding the appearance of this fungus was made in last year's Report (see page 171). The disease again appeared this year, being present upon St. Lawrence as early as Aug. 25. No other additions to the list of affected varieties given last year were noted. Dr. W. T. Connell has been engaged in studying the parasite during the past year, but is not yet ready to report the results of his investigations which he hopes to complete to his own satisfaction this autumn. The fungus found in greatest abundance in the affected areas is one closely resembling *Penicillium glaucum.*

A PEACH DISEASE.

During the past three years I have received from time to time, chiefly through the kind offices of Mr. Milton G. Bruner, Olinda, Ont., specimen peach twigs very much resembling in general characteristics those affected with peach rosette. On July 20, 1897, Mr. Bruner forwarded a number of samples, writing as follows :—" I send you by this mail samples of peach twigs affected by a disease resembling the descriptions I have read of rosette. The specimens are from two different orchards. One of them from Mr. Conover's, near Leamington. This orchard is well cared for and is one of the handsomest in that vicinity. It shows that he has spared no pains in looking after it. The foliage of most of the trees looks healthy and unaffected ; trees are making a vigorous growth ; yet it is polluted with this rosette-like disease. Peach growers are becoming alarmed, as whereever it has made its appearance it has spread steadily and quite rapidly. It affects orchards at Leamington, as well as Olinda, and seems to have taken a strong hold at both places."

The external characteristics of the disease, are (1) abnormally thickened annual shoots ; (2) a marked conduplication of buds ; (3) tufted, broom-like growths involving a single twig or branch or sometimes the entire top of a tree ; (4) the colour of the foliage a somewhat lighter green than normal ; (5) leaves much narrowed and contorted. Upon examining the orchards in question, I found that often a single tufted branch would be noticed upon a tree ; again, half of the top would be involved and on other occasions

the entire tree would bear the peculiar tufted broom-like growths. The twigs were always abnormally thickened by the shortening of the internodes and the close packing together of the buds. Affected trees are not known to recover; growth is greatly retarded and such trees are usually barren. As the disease Peach rosette (whose life history, like the yellow's, has never been worked out) is peculiar to the south and unknown here, specimen twigs taken from these trees were submitted to Dr. Edwin F. Smith, Assistant Pathologist U. S. Dept. of Agriculture, Washington, D.C. Dr. Smith writes under date of July 8, that "the tufted shoots somewhat resemble rosette, but I do not like to pronounce it such. If it is a genuine rosette, the limbs bearing such growths will die this fall, or be dead next spring." In answer to further letters on the subject he writes on August 8, that "the samples sent are not affected with rosette." This is satisfactory as far as the disease known by that name is concerned, but the form so much resembling it at Olinda and Leamington appears to be as much to be dreaded. Not only do trees attacked, not recover, but a single specimen appears to act as a centre from which the malady spreads slowly throughout the orchard.

Remedial.—While true rosette has not been found in the northern peach-growing states it is to be hoped that we have not already a form equally injurious. In view of this possibility, peach growers should not hesitate to remove promptly trees that show symptoms of the presence of this obscure enemy. I am pleased to state that through the intelligent and energetic efforts of Mr. Bruner (fruit tree inspector) fruit growers in the neighbourhood of Olinda are amply warned regarding the gravity of the case and the necessity of instituting radical preventive measures. I regard this enemy as one of the most serious affecting the peach interests of the western peninsula of Ontario, and fruit growers are urged to apply the most heroic treatment possible when these rosette-like growths make their appearance. The mere removal of the affected branch is not sufficient; the tree must come out root and branch.

A SERIOUS GRAPE TROUBLE.

For a number of years—six or seven or more—grape growers between Hamilton and Niagara Falls have noticed here and there in their vineyards unthrifty and sickly looking vines. In some instances the trouble would be confined to a few vines occupying a small area. Again it would be more or less scattered throughout the vineyard. It was brought to my notice in the summer of 1896, by a letter, accompanied with grape foliage, forwarded by Mr. W. M. Hendershott, St. David's, Ont. Early in June of the same year, Mr. L. Woolverton, of Grimsby, forwarded a vine similarly affected, and on 26th June wrote as follows:—

GRIMSBY, 16th June, 1896.

DEAR MR. CRAIG,—I received your letter regarding the affected grape vine, and since that time have been examining the vine more particularly, root, branches and leaves, but have not yet been able to discover any cause for the peculiar disease. To-day Mr. L. Hagar called me in to see his vineyard, and I found that it was sadly affected with the same trouble. He has a large vineyard, and in it there appear to be at least two or three hundred vines that are dying, because of the disease. It appears to be spreading. Last year it began with a few vines of Moore's Early, which were destroyed by it, and this year it has extended as I have stated above. Evidently it is a very serious trouble, and requires immediate attention, or the whole vineyard will be destroyed. Strange to say, it is mostly the Concord which is affected with him, a variety which is seldom infested by Phylloxera. I have dug up a whole vine in Mr. Hagar's vineyard, and forwarded it to you by mail, so that you may have it carefully examined. Please do this and send me your reply as early as possible, in order that we may know what treatment to give our vines.

I am, sir,

Yours very truly,

L. WOOLVERTON.

APPEARANCE OF AFFECTED VINES.

Leaves.—The older leaves normal as to size, but lighter in colour than normal; leaves towards the ends of the canes only partially developed thin, yellow to light, yellow in colour.

Canes.—Short jointed; tendrils often abortive. The trouble manifests its presence by the appearance of yellow coloured areas upon the leaves; these extend until the entire leaf is involved. Growth is checked and becomes sluggish as the leaves turn yellow. When the vine is seriously affected, the older leaves drop off, the younger ones turn deep yellow, remain only partially developed. This with the short-jointed character of the wood renders such vines easily recognizable in the vineyard.

Roots.—The root system of affected vines is very imperfect. As the trouble progresses, the laterals lose vitality, decay and fall away, so that a badly affected vine has only the larger system of roots. The lower rootlets appear to die first, and vines were examined which had completely lost the roots originally thrown out from the base of the cutting. The vines most affected in Mr. Hagar's vineyard were those situated on the lower levels and were chiefly confined to Concord's and Moore's Early. This vineyard, in common with many others in that vicinity, is situated near the base of the ridge which bounds the peach belt along the shore of Lake Ontario.

Mr. Hagar has lost over one hundred vines of Moore's Early and Concords from this cause. Mr. Hendershott's vineyard at St. David's is similarly situated, and is flanked by the limestone ridge. As in the case of Mr. Hagar the vines on the lower portions are usually effected more than those on the higher levels. Roger's varieties, Moore's Early, and Concord suffer most, while Niagara seems to be fairly exempt. The malady makes its appearance soon after growth begins and reaches its height about the end of June or middle of July. In cases of mild attack it may disappear to a large extent as the season advances, notably more pronouncedly during dry seasons than in wet ones—though this may not be considered an invariable rule. Vines lightly affected frequently recover sufficiently to perfect their fruit. Those badly attacked lose their fruit after the leaves. Moore's Early succumbs more readily than other varieties and dwindles down to unhealthly sprouting crowns in two or three years.

Microscopic Examination.—Parts of the affected plants were submitted to Mr. J. Dearness, London, Ont., who kindly reports as follows under date of 6th July:—

"The cause of this disease of the grape is obscure to me. In petioles of discoloured leaves and peduncles of the fruit bunches, I find abundance of minute oval to round spore-like bodies requiring a high magnification to define, but no mycelium or other vegetable phase of an ordinary fungus. These may be bacterial, possibly produced in the disorganized tissue without being the cause of it. The small branches of the root have a diseased appearance, but although I have teased a number of scrapings, shreds and sections of these under the microscope, I fail to find fungus or eggs, sloughs, etc., of aphides or Phylloxera. The roots from the thickness of a pencil upwards seem all right. May there be some injurious cause affecting spongioles and absorption areas of the root tips? So far as I can form an opinion it inclines to locating the disease in the green tissues of the plant. In section after section through the petioles the cambium is destroyed, medullary rays more or less collapsed, in fact nothing left retaining form but cortex bundles and pith."

Specimens were also submitted to the chief of the Division of Vegetable Pathology, Washington, D.C., but nothing definite was learned regarding the cause. Mr. Galloway writes that "the specimens show no fungus attacks, such injuries might result from the plants being in dry soil or wet soil. Grapes affected with a root rot due to a fungus sometimes behave in the manner described by you."

Remedial Experiments.—Presuming that the trouble might be due to unfavourable soil conditions producing imperfect nutrition, some fertilizer experiments were planned and commenced last spring at St. David's and at Grimsby.

The following diagram shows the plan of the experiment, arranged at both places. The fertilizers used were kindly furnished free of cost by the German Kali Works of New York at the instance of Mr. B. VonHerff, to whom I am indebted for valued suggestions in this connection.

I visited both vineyards three times during the summer, noting carefully the health and conditions of the vines in each plot. Nothing definite was ascertained—the work will in all probability need to be continued for a number of years before safe conclusions may be formed.

The plot experiments aim to determine whether the presence or absence of lime plays any important part in producing the characteristic unhealthy condition of the vines. If carried out thoroughly a large amount of additional information will undoubtedly be gained incidentally. The question of where, when and how to use commercial fertilizers is one of great importance to the fruit growers of the Niagara district. It is believed that these experiments inaugurate a line of work that will prove of great value to those who follow up-to-date practices in feeding their vineyards.

The series of plots on the right duplicate those on the left, but in each case 100 pounds of lime has been given in addition.

FERTILIZER EXPERIMENTS, GRAPES, APRIL, 1897.

(W. M. Hendershott, St. David's, Ont.)

27 Vines in each Plot. Plots 30 x 90 feet.

N.

W. | E.

1	30 lbs. Acid Phosphate. 6 " Muriate of Potash.	Ditto. 100 lbs. Lime.	1*a*
2	6 lbs. Muriate of Potash. 10 " Nitrate of Soda.	Ditto. 100 lbs. Lime.	2*a*
3	No Fertilizer.	100 lbs. Lime.	3*a*
4	30 lbs. Acid Phosphate. 10 " Nitrate of Soda.	Ditto. 100 lbs. Lime.	4*a*
5	30 lbs. Acid Phosphate. 10 " Nitrate of Soda. 6 " Muriate of Potash.	Ditto. 100 lbs. Lime.	5*a*
6	30 lbs. Acid Phosphate. 10 " Nitrate of Soda. 12 " Muriate of Potash.	Ditto. 100 lbs. Lime.	6*a*
7	30 lbs. Acid Phosphate. 10 " Nitrate of Soda. 12 " Sulphate of Potash.	Ditto. 100 lbs. Lime.	7*a*
8	No Fertilizer.	100 lbs. Lime.	8*a*

S.

POTATO SCAB.

A large amount of experimental work has been devoted by station workers to the potato disease known as "scab." To Prof. Bolley, of North Dakota Experimental Station, is due the credit of discovering the nature of the malady, and a remedy—corrosive sublimate—which has proved eminently successful in fighting the disease. The dangerously poisonous character of the remedial agent gives it a decidedly undesirable feature. In searching for a germicide less harmful to the person handling it, Prof. Arthur, of the Indiana Experiment Station, reported last winter, through the columns of the agricultural press, and later by special bulletin, that formalin (formic aldehyde), a lately introduced and harmless antiseptic substance, had given him better results in combating potato scab than had corrosive sublimate.

While potato scab is not in potato culture in Eastern Canada a disease of the first importance, yet a considerable percentage of the potato crop is rendered unsaleable by this disease each year. Some experiments were therefore planned and carried out, having for their object the determination of the comparative value of various substances in preventing this disease. Two varieties of potatoes—Clark's No. 1 and Northern Spy—were selected for the trial. The potatoes were washed and found to be an average sample, with a fair proportion of scabby specimens. Each variety was divided into 18 lots of 5 pounds each, care being taken to make the samples as even as possible as to quality. Each sample was soaked for two hours in one of the germicidal solutions. In the case of sample H the potatoes, when cut, were rolled in the *flowers of sulphur*. They were all planted, May 21, on a clean piece of unmanured, sandy loam. They were given good cultivation and sprayed to prevent injury from potato bugs. Each lot occupied 50 feet in the row. The crop was harvested on September 29, the rotten potatoes being separated from the sound and weighed. In order to get an estimate of the percentage of scabby potatoes, an average peck of the produce of each sample planted was selected and the number of diseased specimens counted out. Full particulars are given in the subjoined tabular statement.

EXPERIMENTS TO PREVENT POTATO SCAB.

Potatoes planted 21st May; Harvested 29th September; 5 pounds of seed used in each case. Each row 50 feet long.

—	Weight of Sound Potatoes.		Weight of Rotten Potatoes.		Number of Scabby Potatoes in a Peck.	Number of Clean Potatoes in a Peck.
	Lbs.	Oz.	Lbs.	Oz.		
A { Clark's No. 1	69	..	3	8	3	85
A { Northern Spy	51	..	..	..	2	42
B { Clark's No. 1	60	..	3	8	17	75
B { Northern Spy	59	8	..	..	4	33
Check—						
Clark's No. 1	62	..	4	..	20	70
Northern Spy	66	..	..	..	....	48
C { Clark's No. 1	70	8	3	8	7	72
C { Northern Spy	71	..	..	..	3	49
D { Clark's No. 1	45	..	3	..	12	94
D { Northern Spy	66	8	..	..	1	42
Check—						
Clark's No. 1	50	..	8	..	43	33
Northern Spy	69	8	1	..	..	36

EXPERIMENTS TO PREVENT POTATO SCAB—*Concluded.*

—	Weight of Sound Potatoes.		Weight of Rotten Potatoes.		Number of Scabby Potatoes in a Peck.	Number of Clean Potatoes in a Peck.
	Lbs.	Oz.	Lbs.	Oz.		
E { Clark's No. 1	62	8	4	8	6	73
E { Northern Spy	51	8	..	..	5	67
G { Clark's No. 1	55	8	4	8	28	77
G { Northern Spy	50	..	..	8	7	66
Check—						
Clark's No. 1	59	8	4	8	40	63
Northern Spy	65	..	..	8	....	41
H { Clark's No. 1	52	8	2	8	15	97
H { Northern Spy	47	8	..	..	2	66
F { Clark's No. 1	36	8	1	8	23	98
F { Northern Spy	52	..	..	..	....	82
M { Clark's No. 1	28	..	5	..	....	90
M { Northern Spy	38	8	..	..	....	88
Duplicate—						
L { Northern Spy	16	8	..	..	....	157
L { " planted 23rd June, 1897	19	..	..	..	....	140
I { Clark's No. 1	57	..	6	8	16	60
I { Northern Spy	48	8	..	..	7	62
J { Clark's No. 1	52	8	3	8	38	47
J { Northern Spy	60	..	..	..	14	56
Check—						
Clark's No. 1	43	8	4	8	74	3
Northern Spy	47	8	..	..	17	53
K { Clark's No. 1	64	8	4	..	25	64
K { Northern Spy	73	..	..	..	7	67
L { Clark's No. 1	4	..	1	..	....	53
L { Northern Spy	22	..	..	..	....	85
Check—						
Clark's No. 1	50	8	5	8	33	54
Northern Spy	64	..	..	..	6	70
Duplicate—						
M { Northern Spy	24	8	..	..	3	111
M { " planted 23rd June, 1897	29	8	..	..	....	99

GERMICIDES.

A Corrosive sublimate, ½ ounce to 4 gallons of water.
B Kainite 8 ounces " "
C Nitrate of soda 4 " " "
D " " 2 " " "
E Potassium sulphide 1 " " "
F " " 2 " " "
G Nitrate of soda 1½ " " "
H Flowers of sulphur (seed rolled).
I Formalin, 2 ounces to 4 gallons of water.
J " 1 " " "
K " ½ " " "
L Lysol, 3 per cent solution.
M " 1½ " "

DEDUCTIONS.

It will be seen that the variety Northern Spy was affected to a very small extent by either rot or scab, so that the weight of evidence is given by Clark's No. 1. It will here be noted that over 90 per cent of the yield of the check (untreated) plots of this variety were affected by scab.

In this experiment, as in that reported later in connection with treating bean seed, Lysol gave the most decisively satisfactory results. Corrosive sublimate ranks next, with a very small percentage of affected tubers. Formalin gave very unsatisfactory results as compared to lysol and corrosive sublimate. I cannot account for this variance with the results secured by Professor Arthur. It will be noted that there were duplicate plots of the lysol treated seed, and that the results are harmonious throughout. Nitrate of soda and kainit both gave better results than formalin.

ROSES INJURED BY ABUNDANT GROWTH OF MUCOR.

Rather an unusual occurrence is described in the following letter, which accompanied a package of rose foliage arriving on 3rd May last:—

"MONTREAL, May 3, 1897.

"DEAR SIR,—The inclosed leaves you will find are covered with black dots. Whether it is a fungus or scale insect I should like to know. The leaves are from rose bushes forced under glass in the usual way with florists in this country. The roses are in good condition as to health and vigour, and the fungus, or whatever it is, has appeared only within the last two weeks. About two weeks ago we mulched the rose beds with fresh cow manure obtained from a neighbouring farm. I think it is from this source it came, as it is only since then that it has appeared, and now the whole house is covered with it, even the glass and woodwork. Other plants in the same house are covered with it also. If you can inform me of any means whereby I can cure it and get the house cleaned, I will feel much obliged to you.

"Yours sincerely,

"GEORGE KERR,

"*Gardener to C. Campbell.*"

I took occasion to visit the houses in question, and found the condition of the plants substantially as described by Mr. Kerr. The fresh cow manure laid over the bushes to the depth of three to four inches had furnished the right conditions for the rapid growth of *mucor*, a low form of saprophytic fungus. The small black spherical bodies, like little pellets, covering the rose leaves, mostly on the under sides, were the sporangia of the organism. These had been adjuncted with such force as to carry them a distance of four and a half feet from the breeding beds and lodge them on leaves, glass, woodwork or whatever they might strike. The propelling power seemed remarkable. This organism, while not parasitic in character, rendered the flowers and plants unsaleable and caused considerable loss. The fermentive action was promptly arrested by covering the beds with a light coating of air slaked lime—land plaster would probably serve equally well. Under ordinary circumstances the sporangia will begin to be ejected about ten days after the application of the manure to the beds.

CELERY LEAF SPOT (*Cercospora apii*).

The prevalence of celery leaf spot or rust as it is called by gardeners was the source of much loss this year to the truck growers in the vicinity of large cities,

"OUTREMONT, August 3.

"DEAR SIR.—Inclosed please find a few celery leaves that I picked from my celery patch. They become rusted and fall off, which prevents, to a large extent, the head from forming. Kindly inform me the cause, and give a remedy to prevent it, as it is a great

loss to me. The soil is a light loam with very little sand and underlaid with gravel. This is the second year that celery has been grown on the same ground. An early reply will greatly oblige.

"Very respecfully,

"MAURICE RODLEY."

This disease caused considerable damage to the trial plots of celery grown on gravelly soil on the Experimental Farm and fertilized with spent hot-bed manure. Where this manure was not used the disease was much less injurious. It was kept in check with fair success by using Bordeaux mixture. When the plants are badly attacked all affected leaves should be removed by hand before applying the fungicide. The old trench system with its coating of barn-yard manure on bottom is to be discouraged.

A FUNGOUS PARASITE OF SAN JOSE SCALE.

Prof. Rolfs, Botanist to the Florida Experiment Station, reported last summer the discovery of a fungous parasite (*Sphærophila coccophila*) attacking a native scale (*Aspidiotus obscurus*) of Florida. He was also successful in transplanting the parasite to colonies of San José scale (*A. perniciosus*) Coms., in neighbouring orchards where it flourished even to the extinction of its pernicious host. This was a most important discovery, notices of the work of Prof. Rolfs appeared contemporaneously with the discovery of the San José scale in some of the orchards of southern Ontario. I immediately secured, through the kindness of Prof. Rolfs, a quantity of parasitized scales in the hope of establishing this friend of the fruit grower in infested Canadian orchards. Cultures of the fungus were made by Dr. W. T. Connell of Queen's University, Kingston. These were taken to St. Catharines, Ontario and applied to several trees of Abundance plum, badly infested by San José scale. One treated tree was inclosed in a covering, or tent of cheese cloth and examined from time to time. At the close of the season, the presence of the parasite could not be detected by the aid of a hand lense upon the treated trees under cover or unprotected and a laboratory examination made by Dr. Connell later in the season failed to discover any trace of growth or development of the fungus. It is possible that had the climatic conditions been different the trial might have been successful. As regards moisture the conditions were favourable, but the temperature was rather below the normal for a few days succeeding the application of the cultures. I believe, however, the trial on the whole was a fair one, and failing to succeed, this parasite cannot be looked upon as a practical preventive of San José scale in the climate of southern Ontario.

The following letters from Dr. Connell show the good work done by him in this connection.

"KINGSTON, 6th August.

"DEAR SIR,—I inoculated the plum wood affected with the San José scale, with the scale fungus *Sphærophila coccophila* on Friday last, 30th July. I have examined it from time to time since, and find that the fungus is growing well, invading the bark, and in many cases attacks and grows into the bodies of the scale insect themselves. Whether it grows into the insect during life, I cannot yet say, but it appears highly probable that such is the case.

"My method of inoculation was to brush over portions of the wood (bark) a watery dilution of the fungus grown on bread. I find that when wood is kept dry, that growth is very slight; while when more moist, growth occurs freely in bark.

"Yours very truly,

"W. T. CONNELL.

"KINGSTON, 23rd August.

"DEAR SIR,—I have carefully examined the specimens of plum wood sent by you a few days since. I have not been able to detect any of the scale fungus (*Sphærophila coccophila*) upon the wood.

"With regard to the plum wood, inoculated by myself the early part of this month, with the Fungus, I (as I reported) obtained a good growth. The Fungus simply penetrates the surface layers and remains quite superficial. It has attacked most of the insects, but occasionally one is noted not attacked. Growth ceases when the wood is dried.

"Yours very truly,

"W. T. CONNELL."

BEAN ANTHRACNOSE.

(*Colletotrichium Lindemuthianum*, Sacc.)

This serious disease affecting bush beans was treated of in the annual report for 1892, and again in 1894. It was again very prevalent the past season. In previous reports soaking the seed in copper sulphate 1 oz. to 2 gals. of water, and spraying the plants subsequently with Bordeaux mixture was recommended. In the following table the results obtained from soaking the seed of Early Mohawk in various substances—most of them germicidal in character—are submitted. It will be seen that Lysol in the proportion of 1½ pound to 100 pounds of water gave exceedingly satisfactory results; four per cent only, of the pods being spotted when this substance was used. Formalin was also exceedingly satisfactory, standing second in order of efficacy. There is little to choose between the three solutions of this substance used. Potassium sulphide, a well-known germicide, stands third in order of efficacy. Nitrate of soda, corrosive sublimate and kainit follow in the order named. The two latter do not show marked germicidal qualities. If further trials with this substance should corroborate these results, Lysol should then supersede copper sulphate as a preventive of bean anthracnose, as the results obtained here are much more satisfactory than those obtained in the former experiments with copper sulphate.

VEGETABLES.

SOAKING SEED IN VARIOUS SUBSTANCES TO PREVENT BEAN ANTHRACNOSE.

Seed sown May 22. 2 oz. seed to 20 feet of row.

Variety.	Seed soaked 2 hours. — Substances used.	Weight of 500 Pods.		Number Pods Spotted in 500.	Number Pods Clean in 500.	Weight of Beans when Thrashed out.		Percentage of Pods Diseased.
		Lbs.	Oz.			Lbs.	Oz.	
Mohawk....	Corrosive sublimate: ½ oz. to 4 galls..........	9	0	82	418	5	9	19
"	Kainit: ½ lb. to 4 galls. water...	10	0	134	366	5	6	36
" ..	Nitrate of soda: 1 oz. to 1 gall. water..........	8	0	68	432	5	2	15
"	Nitrate of soda: 1 oz. to 2 galls. water..........	10	0	71	429	4	10	16
"	Potassium sulphide: ½ oz. to 2 galls. water..........	10	0	41	459	5	2	9
"	Nitrate of soda: 1 oz. to 3 galls. water..........	9	0	58	442	4	12	13
"	Formalin: 1 oz. to 2 galls. water	8	0	46	454	4	3	10
"	" ½ " ..	10	0	38	462	4	12	8
"	" ¼ " ..	11	0	40	460	5	8	9
"	Lysol: 3 per cent solution......	Failed	to	germinate.				
"	" 1½ " ...	9	0	20	480	4	14	4
"	*Check untreated..........	....		....	....	....		57

* From Report of 1892.

Beans—Variety Tests.

The varietal test of bush beans detailed in the accompanying table includes 48 kinds. Thirty feet of row of each variety was sown either on May 17 or May 18. Very few varieties were exempt from anthracnose.

Early Varieties.	Late Varieties.	Medium Early.
Challenge Wax.	Boston Favourite.	Detroit Wax.
Black-eyed Wax.	Emperor William.	Early Refugee.
White Advancer.	White Marrow.	Golden Refugee.
Wardwell's Dwarf Kidney.	Refugee or 1,000 to 1.	Ne Plus Ultra.

Experiments with Beans all Sown 17th and 18th May—Table I.

Bush Beans.	Ready for Table.	Total Weight of Green Pods.		Length of Row.	Remarks.
Variety.		Lbs.	Oz.	Feet.	
Algerian Black Wax	July 16	17	0	30	Foliage and pods slightly rusted; pods round yellow; a fair to good grower.
Black Eyed Wax	" 10	16	0	26	Foliage and pods slightly rusted; a dwarf grower.
Best of all Bush	" 26	18	12	30	Foliage slightly rusted; pods clean; long green; slightly flattened; good.
Boston Favourite Large Goddard.	" 23	23	5	30	Foliage and pods slightly rusted; robust grower; inclined to run; pods green; smooth.
Bismarck Black Wax	" 16	10	13	30	Foliage and pods considerably rusted; pods yellow; nearly round; of fair length.
Burpee's New Stringless Green Pod	" 14	5	13	10	Foliage slightly rusted; pods slightly rusted; pods green; nearly round.
Challenge Wax	" 9	18	8	30	Foliage considerably rusted; pods slightly; pods yellow; nearly round.
Canadian Wonder, French	Aug. 6	17	6	25	Foliage and pods considerably rusted; pods long; green.
Detroit Wax	July 14	19	8	30	Foliage slightly rusted; pods flat; yellow; a fairly good bean.
Date Wax	" 16	13	2	30	Foliage considerably rusted; pods slightly; dwarf grower.
Dwarf Lyonnaise	Aug. 6	17	9	26	Foliage and pods slightly rusted; pods long; green; inclined to curl.
Dwarf White Wax	July 18	13	7	26	Foliage very slightly rusted; pod yellow; flat; medium size.
Dwarf Mexican Tree	Aug. 24	18	8	30	Healthy; pods short green.
Dwarf Blue Podded Butter	July 16	8	6	15	Foliage slightly rusted; a long, blue flat pod.
Early China	" 14	15	9	30	Foliage considerably rusted; pods slightly; pods green.
Emperor William	" 17	19	4	30	Foliage badly rusted, pods slightly; foliage rough; pods rough and unshapely.
Early Mohawk	" 14	18	4	30	Foliage slightly rusted; pods clean.
Extra Early Maine Bush	" 16	24	5	30	Foliage very slightly rusted; pods clean, long and smooth; a good grower; an excellent bean.
Extra Early Refugee	" 16	19	4	30	Foliage and pods very slightly rusted; pods green; nearly round.
Early Long Yellow Six Weeks	" 16	12	7	30	Foliage considerably rusted; pods slightly; pods green, long and flat.
Extra Early Valentine	" 16	21	1	30	Foliage very slightly rusted; pods healthy; green; of good size.
Emperor William	" 23	13	2	25	Foliage considerably rusted; pods slightly; pods green; flat.
Extra Early Refugee	" 16	27	6	30	Healthy; free grower; yellow pod; roundish.

EXPERIMENTS WITH BEANS, &c.—TABLE I.—*Concluded.*

Bush Beans.	Ready for Table.	Total Weight of Green Pods.		Length of Row.	Remarks.
		Lbs.	Oz.	Feet.	
Extra Early Market	Aug. 6	6	2	10	Foliage and pods very slightly rusted; pods long; green; nearly round.
Golden Eyed Wax	July 16	23	14	30	Healthy; good grower; clean foliage; pods yellow; smooth; long; flat.
Golden Refugee	Aug. 8	27	14	30	Healthy; pods yellow; medium size; nearly round.
Improved Prolific Black Wax	July 16	15	7	30	Foliage very slightly rusted; pods yellow; slightly rusted.
Improved Golden Wax Bush	" 14	23	3	30	Foliage and pods slightly rusted; pod yellow; flat.
Longsword, French	" 12	23	8	30	Foliage slightly rusted; pods green and smooth, 5 to 7 inches long.
Large White Kidney or Royal Dwarf	" 31	21	5	30	Foliage and pods very slightly rusted; pods medium length; flat; green.
Low's Companion	" 25	21	13	30	Foliage slightly rusted; pods long; green; flat.
Marvele of Paris	" 16	29	11	30	Healthy; pods green; long; smooth; a good variety.
Marblehead Dwarf Horticultural (Lima)	" 10	12	4	30	Foliage and pods considerably rusted; a poor variety here.
Nettle Leaved Bagnolet	" 12	15	7	30	Foliage badly rusted, pods slightly; pods green; flat.
Ne Plus Ultra	" 16	18	2	30	Foliage and pods slightly rusted; pods long; green; flat.
Pride of Newtown	" 14	23	1	30	Foliage and pods slightly rusted; pod green; long; flat; a good variety.
Round Yellow Six Weeks	" 16	11	1	30	Foliage slightly rusted; dwarf grower; fair length of pod.
Refugee or 1,000 to 1	Aug. 6	33	8	30	Foliage healthy; pods slightly rusted; robust grower, with whitish pods; a good late variety.
Refugee Wax	July 14	20	6	30	Foliage and pods slightly rusted; yellow round pod; a fair variety.
Red Flageolet Wax	" 16	12	1	25	Foliage slightly rusted: pods yellow; flat; smooth and good.
Rust Proof Golden Wax	" 14	15	5	30	Foliage and pods considerably rusted; pods long; yellow; flat.
Triumph of the Frames	" 14	8	1	22	Foliage slightly rusted; pods clean at first; rusted late in the season; dwarf grower; a fair bean.
The Black Shah	Aug. 6	12	5	15	Foliage and pods slightly rusted; pods long, green, flat and narrow.
White Advancer, French	July 12	16	13	30	Foliage slightly rusted; pods clean; later:—Foliage considerably rusted; pods slight; pod green; 4 to 6 inches long.
White Marrow	" 20	26	5	30	Foliage and pods slightly rusted; a strong grower; inclined to run; pod; flat; green.
White Valentine	" 16	26	4	30	Foliage very slightly rusted; pods green; a strong grower.
Wardwell's Dwarf Kidney Wax	" 12	19	4	28	Foliage and pods very slightly rusted; pods yellow, long, flat and smooth; a good bean.
Yosemite Mammoth Wax	" 16	17	3	28	Pods badly rusted late in season; pods yellow; large; near round; has a tendency to curl.

POLE BEANS.

The following 19 varieties were sown at the same time as the bush beans. The season proved too short to allow of the maturation of the latest kinds. Leaving out the scarlet runner type, the yields do not approximate with those secured from the "bush" section :—

BEST VARIETIES.

Early Varieties.	Late Varieties.
Southern Crease.	Black Algerian Wax.
Holborn Masterpiece.	Dutch Case Knife.
Golden Champion.	Speckled Cranberry.
Flageolet Wax.	Speckled or Cut Short.

Experiments with Beans all sown 18th May.—Table II.—Pole Beans.

Pole Beans.	Ready for Table.	Total Weight of Green Pods.		Length of Row.	Remarks.
Variety.		Lbs.	Oz.	Feet.	
Black Algerian Wax...	Aug. 16	15	12	30	Foliage very slightly rusted ; pods medium size yellow, flat.
Dutch Case Knife.....	" 18	21	0	30	Foliage and pods slightly rusted ; pods very long, flat and green.
French Asparagus.....	" 30	1	12	30	Foliage and pods slightly rusted ; pod green, round, from 6 to 8 inches long.
Flageolet Wax.........	" 6	9	14	30	Foliage and pods considerably rusted ; pods yellow, long, narrow and flat.
French Yard Long....	....	....		25	Late ; no pods when frost came, Sept. 26.
Golden Andalusia.....	Aug. 16	17	7	30	Foliage and pods slightly rusted : pod yellow of medium size, flat.
German Wax	" 16	16	12	15	Foliage and pods very slightly rusted ; pods yellow, from 4 to 6 inches long, flat.
Golden Champion..	July 31	8	4	15	Foliage and pods slightly rusted ; a yellow round pod.
Holborn Masterpeice...	" 31	11	11	30	Foliage badly rusted, pods clean ; pods slightly rusted, from 6 to 10 inches long, green.
Horticultural Speckled Cranberry	Aug. 18	34	6	30	Healthy ; pods about 4 inches long, green, flat.
Jubilee Runner........	....	....		30	Foliage slightly rusted ; only 4 pods on row at date of first frost ; pod green, 8 to 10 inches long.
Kentucky Wonder....	Aug. 6	15	5	30	Foliage and pods considerably rusted ; pods green, narrow to round, medium length ; a poor variety.
Mont d'Or.............	July 25	17	0	30	Foliage slightly and pods badly rusted ; pods long, yellow and flat.
Southern Prolific... .	Aug. 14	50	12	30	Healthy ; pods green, long, flat and narrow.
Scarlet Runner.......	" 14	49	1	30	Healthy ; large flat green pod.
Speckled, or Cut Short.	" 18	23	14	30	Healthy ; pods green about 3 inches long, flat.
Southern Crease, black.	July 21	8	3	30	Foliage and pods badly rusted ; a short green pod.
White Algerian Wax..	Aug. 8	17	10	30	Foliage and pods slightly rusted; a yellow medium size pod.
White Dutch Running.	" 14	39	1	30	Healthy ; pods about 8 inches long, green and flat.

LIMA AND BROAD WINDSOR BEANS.

Of the 11 varieties of Limas tested only one of them produced a paying crop. This failure was principally due to their lateness. There seemed to be insufficient summer heat to bring them to maturity. A notable exception is that of Thorburn's *Horticultural Lima.* The same variety from other seedsmen did not do as well. The yield of this variety approximated the best of the "pole" or "bush" varieties.

Of the Broad Windsor type the best podding variety was *Leviathan.*

EXPERIMENTS with LIMA BEANS all sown 17th and 18th May—TABLE III.

Beans Lima.	Ready for Table.	Total Weight of Green Pods.		Length of Row.	Remarks.
Variety.		Lbs.	Oz.	Feet.	
Burpee's Bush Lima	....	....	....	26	Foliage slightly rusted, late.
do	....	....	....	30	Healthy.
Challenger Lima	Aug. 28	8	4	18	Foliage and pods slightly rusted.
Dreer Lima	....	....	....	....	Healthy; only 4 plants germinated.
Dreer Bush Lima	....	....	....	....	Healthy; too late.
Dwarf Lima, Kumerle Strain	Aug. 24	6	5	26	Healthy; pods green, short and flat.
King of the Garden Lima	Sept. 15	0	2	10	Healthy; too late.
Henderson's Bush Lima or Dwarf Sieva	Aug. 21	2	8	30	Foliage slightly rusted, pods short, green and flat.
Horticultural Lima	July 20	35	1	30	Healthy; strong grower, with a large, broad, green pod.
do	" 25	10	6	15	Foliage very slightly rusted, pods flat, of medium size.
Large White Lima	Aug. 28	1	5	17	Healthy; late.
New Dwarf Lima, Jackson's Wonder.	" 21	5	14	15	Healthy; pods green, flat.
Broad Windsor	" 6	7	8	30	Slightly rusted.
Early Mazagan	" 28	4	0	30	Foliage and pods slightly rusted.
Green Nonpareil	" 24	3	3	30	Foliage and pods considerably rusted.
Harlington Green Windsor	" 6	3	10	30	Healthy.
Leviathan	" 18	15	12	30	Healthy.
Sword Long-pod	" 6	4	14	30	Foliage slightly rusted, August 22, 1894. Foliage and pods considerably rusted.
Small Horse Bean	" 20	0	6	30	Slightly rusted, a tall grower, pods small.

SOAKING SEED PEASE AND BEANS IN DISSOLVED CHEMICAL FERTILIZERS.

Some experiments were tried last year in soaking the seed of pease and beans in nitrate of soda in solution with the object of ascertaining the effect upon germination and yield.

Nitrate of soda was used in three strengths—one, two and three ounces to the gallon of water. The seed was soaked for one hour then planted, one hundred seeds occupying a space of thirty feet in the row.

RESULTS.

Pease.—The percentage of germination did not vary to a marked extent, but there was a regular increase of yield of each variety with the strength of the fertilizer used :—Heroine excepted, the yield of this remained practically the same in each case.

Beans.—The results here were so variable as to preclude safe generalization.

CELERY.

A VARIETAL TEST.

The following table gives particulars of information gained in growing thirty varieties of celery including five of celeriac. It was arranged that 24 plants should compose the number of each variety tested. In a few instances owing to bad seed or accident it was impossible to obtain the requisite number. The plants were grown under the trench system in single rows. Rust and spot caused serious damage in early

summer (see note on leaf spot). This attack I attributed largely to the effect of spent hot-bed manure used in the bottom of the trenches. Market gardeners do not now follow the trenching system, but plant on the level and hill up. The plants should be "handled" twice before the final earthing up takes place. This means that the leaves should be drawn together by hand and sufficient soil packed about the base of the plants as will hold them compactly in an upright position. When the plants are "hilled" or "earthed" care should be taken to prevent the soil from sifting in between the leaves. If this occurs, it destroys the quality of the "heart" and causes rusting.

Among the best early varieties are the following :—*Golden Self Blanching, Paris Golden Yellow and Golden Dwarf.*

Medium Early :—*Improved White Plume, White Walnut, Pascal, Boston Market.*
Late :—*London Red, Covent Garden, Golden Heart, Schumacker, Fin de siecle.*

Celery I.

These were all sown on 9th April, transplanted on 19th May and planted out 26th June.

Celery grown in Trenches.	Seedsman.	Number Planted.	Weight when Lifted.		Condition when Taken up 30th October.
Variety.			Lbs.	Oz.	
Giant Pascal	Thorburn	24	30	0	Green ; solid ; slight amount of rot ; slightly rusted.
Covent Garden Rose	"	24	33	8	Solid ; not blanched ; slightly rusted.
Large Ribbed Kalamazoo	"	24	29	0	Small heads ; firm ; not well blanched.
Large Red Self Blanching	"	24	30	12	Dwarf ; thick ; solid ; clean ; not well blanched
Pink Plume	"	24	44	12	Solid ; clean heads ; not well blanched ; tall.
Schumacker	"	24	51	12	Short and stout ; quite green ; clear of rust.
Cooper's Half Dwarf	"	24	44	4	Green ; medium height ; slightly rusted.
Giant White	Henderson	24	53	0	Tall ; green ; slightly blanched ; suckers freely.
Cooper's Improved Cutting	Thorburn	24	70	4	Suckers freely ; green and slightly rusted.
Golden Rose	Henderson	24	37	0	Thick ; dwarf ; solid ; not well blanched.
Rose Ribbed Paris	Breck	24	31	12	Same as the last.
Improved White Plume	Thorburn	21	30	12	Not well blanched ; slightly rusted.
London Red	Henderson	21	34	12	Small ; not blanched ; late.
Dwarf White	"	23	29	8	Dwarf ; not well blanched.
Triumph	Ewing	23	38	0	Short ; solid ; not well blanched.
Fin De Siecle	Thorburn	24	44	12	Very green ; none fit for table.
Paris Golden Yellow	Ewing	24	32	12	Short ; not well blanched ; slightly rusted.
Sandringham Dwarf White	Thorburn	24	47	9	Medium ; dwarf ; very green ; solid heads.
Carter's Dwarf Crimson	Farquhar	24	32	2	Dwarf ; not well blanched ; slightly rusted.
Golden Self Blanching	Thorburn	24	51	8	Fairly blanched ; solid ; very good.
" (No Manure.)	"	24	24	0	Stout ; green ; slightly rusted ; not fit for table.
White Walnut	"	24	48	3	Medium size ; green ; slightly rusted.
Perfection Heartwell	"	24	28	3	Medium size ; slender ; fairly solid ; green ; slightly rusted.
Boston Market	"	11	19	11	Very stout ; solid ; not all blanched ; tendency to sucker.
Half Dwarf	Henderson	3	10	0	Short ; thick ; green ; solid ; slightly rusted.
Golden Dwarf	"	2	4	9	Medium height ; blanched ; clean ; solid ; good for market.
Parson's Russian Princess	Simmers	24	26	9	Uniform, but not well blanched ; slightly rusted.
Golden Heart	Ewing	18	60	12	Medium height ; very green ; clean ; suckers freely.
Celeriac, Thorb. Giant	Thorburn	22	30	0	Large roots ; clear of rust.
Celeriac New Apple	"	23	22	0	Good size ; not quite so large as the last.
Celeriac Turnip-Rooted	"	24	31	12	Fair size ; roots and foliage clean.

The following varieties were tested in 1896. They are chiefly from English and French seedsmen:—

Carter's Solid Ivory.—Short and stocky; considerably rusted; well blanched; rather bitter; flavour not as good as Standard Bearer.

Carter's Incomparable Crimson.—Tall; late; red; free from rust; blanches moderately well; crisp and of good quality.

De Candolle.—White; medium grower, but late; fairly solid; very nutty and good flavour.

Evan's New Triumph.—Dwarf variety; free from rust; stalks stout; lacks crispness and flavour.

New Perle Le Grand.—Tall; strong; white: rather coarse; watery; somewhat lacking in flavour.

Perle Le Grand.—About the same as New Perle Le Grand, but rather smaller stalks; quality, medium to poor.

Rennie's Giant White.—Medium grower; rather uneven; fair sized stalks; quality fair, solid, but not high flavoured.

Standard Bearer.—Red, large, coarse stalks; fairly well blanched: brittle, very tender; good quality; late.

Vaughan's Giant Golden Dwarf.—Large; not self-blanching; fair size, but of poor quality.

White Triumph.—Medium grower; fair sized stalks; some rust; firm, brittle, good quality, nutty.

Growing Celery in "Spent" Hot-beds *vs.* Cold Frames.

After growing the annual supply of cabbage, cauliflowers and tomato plants, the farmer's hot-bed usually stands idle till the next season comes round. It is true that its phases of usefulness during this period are not numerous but there is at least one purpose which it will serve with great satisfaction to the housewife, viz.: the growing of a supply of celery for winter use. This may be done without removing the manure, by adding an inch or two of soil to the surface—setting the plants 7 x 7 inches apart and watering frequently during the fore part of the season. Of course the bed of manure beneath the covering of soil facilitates drainage so much that the plants require close watching at first in order to prevent injury from drying out. If the manure is thoroughly soaked before the plants are set less difficulty will be experienced. I have found that cold frames give better results in growing celery on the bed plan than do hot-beds.

The following table gives the results of tests of growing celery in cold frame and in hot-bed, both beds being sub-irrigated. The beds were 6 feet wide and 24 feet long. Two lines of three-inch tile were laid three feet apart the full length of the bed and 9 inches below the surface. An upturned tile at each end gave opportunity for introducing water which was done once and sometimes twice each week. In growing celery after this intensive method the labour of cultivating and earthing is largely obviated; but it must be remembered that the drain upon the moisture and fertility of the soil is very great and must be adequately met if healthy and vigorous plants are to be secured.

It will be seen by the yields set forth in the subjoined table that the gross weight of 16 plants grown in the "cold frame"—that is a frame in which no manure had been used to give bottom heat—was greater in almost every instance than 18 plants of the same variety grown in the hot-bed. With regard to quality there was little to choose. This result is probably due to the fact that the conditions of moisture in the cold frame

were more uniform throughout the season than those obtaining in the hot-bed. The results are very marked, the average weight per stalk of the "hot-bed" grown plants being 11 ounces each, while that of "cold frame" plants was over a pound each.

CELERY II.

SUB-IRRIGATION EXPERIMENTS.

Seed sown, April 9; pricked out, May 19; planted, June 30; distance apart, 7 x 7 inches; sub-irrigated as needed.

Variety.	Sub-Irrigated in Hot-bed.			Remarks.	Sub-Irrigated in Cold Frame.			Remarks.
	Number of Plants.	Weight when taken up.			Number of Plants.	Weight when taken up.		
		Lbs.	Oz.			Lbs.	Oz.	
Crawford's Half Dwarf..	18	16	14	Unblanched; fair sized heads; slightly rusted....	16	17	13	Unblanched; slightly rusted
Cooper's Imp. Cutting...	18	10	11	Unblanched; slightly rusted	16	16	13	" pithy "
Turnip-rooted Celeriac...	18	16	9	Roots medium size firm.....	16	12	12	Good size; tall; rusted.
Covent Garden Rose	18	14	14	Unblanched; large; rusted.	16	16	12	" " "
Giant Celeriac (Thorb.)..	18	8	12	Med. height; roots small...	16	13	4	Med. size; " healthy.
New Apple Celeriac.....	18	5	4	Heads small; rusted.......	16	8	12	Small; pithy; rusted.
Dwarf Crimson (Carter).	18	14	14	Unblanched; solid; slightly rusted..................	16	18	12	Unblanched "
" White...........	18	9	12	Unblanched; solid; slightly rusted..................	16	13	12	Med. sized; blanched; rusted
Fin de Siecle........ ...	18	14	12	Fairly blanched; healthy..	16	21	8	Well blanched; healthy.
Giant Pascal	18	15	12	" " " ...	16	23	12	Unblanched; crisp; rusted.
Golden Rose........ ...	18	6	4	Small; rusted..............	16	8	4	Small; farly blanched "
Giant White............	18	17	12	Unblanched rusted				
Triumph	18	12	4	" "	16	16	12	Dwarf; late; crisp; slightly rusted.
Rose Ribbed Self Blanching..................	18	8	12	Med. size; blanched; rusted	16	10	12	Small; blanched; slightly rusted.
London Red....	18	14	12	Unblanched; rusted......	16	15	4	Unblanched; spindling; rusted.
Paris Golden Yellow....	18	8	10	Small heads; blanched.....	16	12	12	Small; blanched; slightly rusted.
Imp. White Plume......	18	11	4	Slender stalks; rusted.....	16	19	0	Fair sized heads; blanched; slightly rusted.
Golden Self Blanching...	18	10	0	Small " blanched...	16	16	12	Blanched; solid; slightly rusted.
Sandringham	....	.....		....	16	25	0	Unblanched; crisp; firm; slightly rusted.
Total weights.....	324	217	12	Av'ge weight of stalks, 11 oz.	288	298	6	Av'ge weight of stalks, 16½ oz.

CUCUMBERS.

The number of varieties of this vegetable now offered to the public by seedsmen, is much greater than is generally supposed. In the accompanying table the behaviour of 24 kinds, including pickling sorts, all grown under the same circumstances, is described. Important points in connection with the cultivation of the cucumber are health of vine, earliness, desirable form and productiveness. By comparing the number of fruits produced, with the yield in pounds, an idea of the individual size of the cucumber (fruit)

may be obtained, e.g., Cool and Crisp produced 204 fruits weighing 229½ pounds ; in other words the average weight of each cucumber would be something over a pound, while Extra Early Seedling produced 79 fruits weighing only 35 pounds, giving less than half a pound to each cucumber. It should be stated that the seed was sown in pots in a hot-bed and the plants turned out of these when removed to the field.

VARIETIES RECOMMENDED.

EARLY.—Extra Early Seedling, Evergreen, Early Russian, Nichol's Medium Green.

MEDIUM EARLY.—Giant Pera, Peerless, White Spine, Long Green.

LATE.—Jap. Climbing, Cool and Crisp.

PICKLING.—Commercial, Boston.

CUCUMBERS—Test of Varieties.

These were all sown on 21st April and planted out 11th June, three hills being planted of each variety.

Name of Variety.	Seedsman.	Ready for use.	Number of Fruits Produced.	Yield in lbs.	Remarks.
Cool and Crisp...... ...	Simmers..	July 20	204	229·8	Medium grower; fruit medium size; green; few spines; prolific; late.
Evergreen..............	Thorburn.	" 10	125	103·4	Vine fairly healthy; fruit large, green, moderately smooth.
Extra Early Seedling....	" .	" 4	79	34·13	Very much like Nichol's Medium Green.
Early Short Green.......	" ..	" 14	41	28·6	Practically the same as Early Russian, with fewer spines.
Early Russian	" ..	" 12	76	28·12	Very weak grower; cucumbers small, oval or oblong.
Early White Spine	" ..	" 18	75	65·12	Same as Peerless.
Extra Long White Spine	" ..	" 18	77	82·2	Later and larger than the type.
Giant Pera (New)........	Steele	" 16	29	34·7	Weak grower; troubled with mildew.
"	Thorburn.	" 16	48	66·0	More prolific than last; larger.
Improved White Spine..	" ..	" 16	86	59·11	Medium grower; fair size.
Japanese Climbing......	Dreer	" 21	69	65·0	Fair grower; medium size; bronzy-green colour; spineless.
Long Green Turkey......	Thorburn.	" 17	61	68·12	Fair grower; large; oval; orange; smooth.
Long Green.............	" ..	" 18	136	110·12	More productive than White Spine; larger and longer.
Nichol's Medium Green..	" ..	" 12	113	84·12	Moderate grower; fairly early; medium size; smooth; oblong.
Peerless................	" ..	" 18	69	64·12	Fair grower; very prolific; medium to large; green, spined.
Tilby's Hybrid	" ..	" 16	51	60·9	Good grower; an early variety.
White Pearl............	" ..	" 18	62	46·11	Fair grower; white; medium size; oval or oblong; spines very small.
Boston Pickling	" ..	" 4	....	34·2	A standard variety.
Commercial Pickling....	" ..	" 6	....	67·13	Strong grower; fair bearer; late.
Everbearing	" ..	" 8	....	7·2	Very weak growth; unproductive.
Green Prolific Pickling.	" ..	" 8	....	18·4	Vine weak, subject to mildew.
Milwaukee Pickling	Currie...	" 4	....	20·14	Fair grower; small size.
Siberian	Simmers..	" 4	....	20·4	Weak grower; no fruit.
Golden	....	....	....	....	Small; uniform in size; rather a poor bearer.

EXPERIMENTS WITH ONIONS.

In growing onions this season, the percentage of "thick necks" was remarkably large. This characterized the crop from transplanted as well as untransplanted plots. The soil was well drained, sandy loam, top-dressed in the spring with rotted barn-yard manure. The following table gives the yield of 23 varieties. The yields of good onions are phenomenally small, and that of "thick necks" astonishingly heavy. This term "thick necks" is a market gardeners' name applied to onions that form an unmerchantable product with thick fleshy necks and small bulbs. I know of no satisfactory explanation of this peculiarity of the onion to revert to original types, unless it be faulty seed selection. Strasburg (yellow) was one of the best. Paris Silver Skin, Large Portugal, and Early Red Globe were a few of those most satisfactory.

ONIONS.—Test of Varieties.—All sown in rows 20 feet long.

Varieties.	Seedsman.	Date of Sowing Seed.	Yield of Good Onions.		Yield of Thicknecks.		Remarks.
			Lbs.	Oz.	Lbs.	Oz.	
White.							
Early Barletta	Thorburn.	May 13..	2	8	1	8	Rough and very poor.
Paris Silver Skin	" ..	" 13..	7	8	6	8	Large, flat, coarse.
Victoria, Italian	" ..	" 13..	..	..	34	..	All thicknecks.
Large Portugal	" ..	" 13..	10	..	10	..	Large, flat, solid.
" Globe	" ..	" 13..	6	8	16	..	Large, smooth.
Bermuda	" ..	" 13..	1	8	1	8	Flat, medium to small, rough; germinated poorly.
The Queen	Ewing	" 13..	1	8	13	8	Flat, rough; not a good onion in the row.
Oxonian Prize	"	" 13..	..	..	17	..	All thicknecks.
English Pickling	Thorburn.	" 15..	6	..	14	8	Grew too large for pickling.
Excelsior "	" ..	" 15..	2	8	13	..	" "
Welsh	" ..	" 15..	..	..	18	8	Of the leek type.
Red.							
Creole	" ..	" 13..	2	8	1	8	Bad seed.
Early Globe	" ..	" 13..	7	8	14	8	A standard.
Globe Maderia	" ..	" 13..	3	8	28	8	
Giant Rocca red	" ..	" 13..	..	..	20	8	Resembled leeks.
Flat Maderia	" ..	" 13..	4	..	18	..	Rough, pink and white, poor.
Large Globe	" .	" 13..	1	8	10	8	Large round dark red, uniform in size, quite solid.
Yellow.							
Globe Danvers	" ..	" 15..	3	8	9	8	Very small, round, rather irregular.
Globe	" ..	" 15..	..	..	18	..	
Danvers	" ..	" 15..	6	..	11	..	
Strasburg	" ..	" 15..	12	8	7	8	Smooth, globe shaped, good.
Globe Spanish	" ..	" 15..	..	..	20	8	Very large but all neck.
Giant Rocca yellow	" ..	" 15..	..	..	14	8	

TRANSPLANTING ONIONS.

Some interesting data appears in the following tables upon this subject. It may be seen (1) that three sowings were made in the hotbed at intervals of 12 days apart; (2) the plants were all set in the field on the same day; (3) that the total yield of merchantable onions is much greater for the *third sowing* than either of the other two—in fact more than the product of the two combined; (4) the yield of good and bad onions is larger for the third sowing than either of the other two series; (5) the first

sowing gave the most regular returns for each variety, White Victoria being the only one which failed to produce any merchantable bulbs—this result was the same throughout.

ONIONS—TABLE II.

SEED SOWN IN HOT-BED. TRANSPLANTED TO THE FIELD 9TH JUNE.

Varieties.	Seedsman.	1st Sowing, 8th April.		2nd Sowing, 20th April.		3rd Sowing, 30th April.		Length of Rows.
		Weight of Good Onions.	Weight of Thick-necks.	Weight of Good Onions.	Weight of Thick-necks.	Weight of Good Onions.	Weight of Thick-necks.	
		Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz	Lbs. Oz.	Feet.
Large Red Wethersfield....	Thorburn.	19 8	3 0	9 8	13 8	32 0	0 0	20
Red Victoria..............	" ..	4 0	55 0	0 0	26 0	0 0	45 8	20
White Large Tripoli.......	" ..	4 0	4 0	7 0	14 8	12 0	5 8	20
Red Ætna.	" ..	16 0	8 0	0 0	20 8	8 8	12 8	20
White Victoria...........	" ..	0 0	34 0	0 0	34 0	0 0	35 0	20
Red Mammoth Garganus...	" ..	6 8	28 0	5 0	13 8	13 8	21 8	20
White " ..	" ..	7 8	15 0	8 8	8 8	15 8	11 0	20
Prizetaker................	Hend.....	5 0	19 0	0 0	13 0	18 8	10 0	20
Total weight	....	62 8	116 8	30 0	143 8	100 0	141 0	

ONION SEED SOWN IN THE OPEN EARLY AND LATE.

The following table gives yields for the same varieties of onions grown by sowing the seed in the field on 13th May, 25th May and 4th June. When the plants reached the proper size they were thinned the usual distances according to size, viz., 2 to 4 inches.

Results :—It will be seen (1) that the total yields of the same varieties, are much smaller than where they have been transplanted, (2) that the yield from the first sowing of seed is larger than either of the others, (3) that there is a much larger proportion of "thick necks" to the total product of merchantable onions in all the sowings here than there is when the same varieties were transplanted. Transplanting them increases the total yield and decreases the quantity of "thick necks" or unmerchantable onions.

ONIONS—TABLE III.

SEED SOWN IN FIELD.

Varieties.	Seedsman.	1st Sowing, 13th May.		2nd Sowing, 25th May.		3rd Sowing, 4th June.		Length of Rows.
		Weight of Good Onions.	Weight of Thick-necks.	Weight of Good Onions.	Weight of Thick-necks.	Weight of Good Onions.	Weight of Thick-necks.	
		Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Feet.
Large Red Wethersfield....	Thorburn.	8 8	14 0	5 8	13 8	2 8	20 8	20
White Giant Tripoli..	" ..	3 8	9 8	5 8	9 8	0 0	15 8	20
Red Ætna................	" ..	1 8	15 8	4 0	18 0	0 0	14 0	20
White Victoria	" ..	0 0	13 0	0 0	22 0	0 0	14 8	20
Red "	" ..	1 0	21 8	0 0	27 8	0 8	20 0	20
Red Mammoth Garganus...	" ..	0 0	15 0	3 0	14 8	0 0	11 0	20
White " ..	" ..	8 0	15 0	4 0	16 8	0 0	9 0	20
Prizetaker............ ...	Hend.....	4 0	30 0	0 0	28 0	0 0	15 0	20
Total Weight......	....	26 8	133 8	22 0	149 8	3 0	119 8	

TOBACCO.

The experiments of the year with this crop covered the following features (1) cultural tests; (2) trials of fertilizers; (3) "topping," the best time to do it; (4) the proper number of leaves to allow each plant.

(1.) CULTURAL—TRANSPLANTING EXPERIMENTS.

Three years ago strikingly beneficial results in growing tobacco plants were obtained by transplanting from the hot-bed to a cold frame before setting them in the field. The object of the following experiments was mainly to determine the relative advantages of cold frame and hot-beds in receiving the small plants at the first pricking out. The spring season was very unfavourable for either hot-bed or cold frame grown plants. At the time of setting out in the field, the hot-bed grown plants were stronger and larger than those from the cold frame. Both sets of plants, however, did well in the field, and at harvesting time, as shown by the yields of green leaf, the differences were not sufficiently constant to allow of reliable conclusions being drawn. It is a safe practice, however, in Eastern Ontario and the province of Quebec to prick the young plants into a second hot-bed before setting them in the field. This gives them stockiness and vigour at transplanting time. The number of plants lost in setting them in the field is much less if they have been treated in this way.

TOBACCO—TABLE I.

EXPERIMENTS IN GROWING THE PLANTS.

Variety.	Date of Sowing.	Plants—How Treated.	Planted in Field.	Number of Plants.	Date of Harvesting.	Weight of 1st Grade. Green.	Weight of 2nd Grade. Green.
						Lbs.	Lbs.
Yellow Pryor........	April 9	Not transplanted..........	June 7	113	Sept. 18	271	29
"	" 9	Transplanted to cold frame.	" 7	111	" 18	319	25
"	" 9	" hot-bed....	" 7	113	" 16	234	38
Connecticut Seed Leaf.	" 9	Not transplanted........	" 7	113	" 8	540	22
" " ..	" 9	Transplanted to cold frame.	" 7	113	" 8	465	32
" " ..	" 9	" hot bed....	" 7	112	" 8	494	27
Pennsylvania " .	" 9	Not transplanted......	" 7	113	" 18	481	31
" " .	" 9	Transplanted to hot bed....	" 7	113	" 18	425	30
Persian Rose.........	" 6	Not transplanted.......	" 7	112	" 13	243	41
"	" 9	Transplanted to hot bed....	" 7	113	" 13	223	64
White Burley.........	" 9	Not transplanted.........	" 7	91	Aug. 31	404	69
"	" 9	Transplanted to cold frame.	" 7	331	" 31	1,565	191

FERTILIZERS.

The results of the fertilizer trials set forth in table II. Each plot contained 24 plants made up of an equal number of 6 varieties. The plants were set out on 8th June, and the fertilizers applied a few days afterwards, the results are not striking. The largest yield of green leaf was obtained from superphosphate, wood ashes and nitrate of soda (No. 4). The former two with sulphate of ammonia, also gave the second heaviest yield. Barn-yard manure applied in excessively heavy dressings gave the third largest yield. Muriate of potash, wood ashes and nitrate of soda did not give satisfactory returns as compared with the others when applied separately.

TOBACCO—TABLE II.

EXPERIMENTS WITH FERTILIZERS.

All these varieties were sown on the 9th of April, were planted out on 8th of June, and were gathered on 14th September, twenty-four plants were used of each sort.

Fertilizer.	Yellow Pryor. Weight.		Yellow Oronoka. Weight.		Penn. Seed Leaf. Weight.		White Burley. Weight.		Conn. Seed Leaf. Weight.		Persian Rose. Weight.		Total weight, 24 plants. Green.		Fertilizers used.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.		
No. I.....	11	0	15	0	22	8	21	0	13	8	12	8	94	8	Superphosphate, 10 lbs..... Muriate of potash " ..... Sulphate of ammonia, 10 lbs.	10 lbs. to 24 plants.
" II....	15	8	13	8	17	0	20	0	15	0	13	8	104	8	Superphosphate, 15 lbs...... Wood ashes, 10 lbs.......... Sulphate of ammonia, 10 lbs..	"
" III ...	14	8	15	0	22	0	20	8	17	8	16	8	106	8	Superphosphate, 15 lbs.... .. Wood ashes, 15 lbs.......... Nitrate of soda 5 lbs.........	"
" IV....	17	0	15	8	18	8	19	8	19	0	12	0	100	8	Superphosphate 15 lbs ..... Muriate of potash, 10 lbs..... Nitrate of soda, 5 lbs	"
" V	14	8	14	8	26	8	19	8	17	8	9	0	101	8	Barn yard manure (green) 200 lbs. to 24 plants.	
" VI....	15	0	13	0	26	0	19	8	16	0	11	0	95	0	Wood ashes, 24 lbs. to 24 plants.	
" VII...	13	0	15	0	20	0	19	8	17	8	11	0	95	0	Nitrate of soda, 6 lbs. to 24 plants.	
" VIII..	12	8	13	0	13	8	19	8	17	0	10	0	85	0	Muriate of potash, 6 lbs. to 24 plants.	
" IX....	15	8	12	0	16	0	21	0	13	0	8	8	96	0	Check plot ; no fertilizer.	

TOPPING AND PRIMING.

"Topping" is the operation of removing the flower stalk, with one or more of the upper and smaller leaves. The energies of the plant are thus diverted from the natural channel—the production of seed—to the artificial—the more perfect development of its leafy tissue. After the first topping, numerous suckers usually appear in the axils of the leaves ; these should be promptly removed. "Priming" is the term used to designate the removal of one or two of the lower or primary leaves, which are usually inferior in size and quality, frequently becoming torn and injured by the cultivator. I have noted the fact in past years that early "topping" usually meant an abundant and persistent growth of suckers. To test this, a block containing 108 plants including 7 varieties was taken and divided into 6 equal portions. Series I contained two plots. Plants in plot 1 were cut back to 9 leaves on July 20, those in plot 2 were cut back to 11 leaves on the same date.

The number of plants in series II and III were divided and cut back respectively on July 26th and August 2nd.

RESULTS.

Field notes show that it was necessary to "sucker" plants in series I twice after topping them. This work of removing the suckers is laborious and rather expensive.

Plants in series II were "suckered" twice after "tipping" but the amount of work was much less than that required in series I.

Plants in series III were "suckered" once. This with the removal of occasional sprouts kept them in order.

Yields.—(1.) Larger yields were obtained from the later "topping" than the earlier. (2). The greater number of leaves gave uniformly the heaviest yields.

TOBACCO—TABLE III.

EXPERIMENTS IN TOPPING.

Seed sown 9th April, planted out 7th June; 18 plants were used in each case.

Variety.	Cut back to 9 Leaves.	Weight of Green Leaf.	Cut back to 11 Leaves.	Weight of Green Leaf.	Date of Gathering
	1897.	Lbs.	1897.	Lbs.	1897.
Series I.—					
White Burley	July 20	62	July 20	102	Sept. 3
Yellow Oronoko	" 20	41	" 20	53	" 15
" Pryor	" 20	47	" 20	53	" 15
Cannelle	" 20	15	" 20	17	" 15
Connecticut Seed Leaf	" 20	61	" 20	78	" 15
Persian Rose	" 20	32	" 20	33	" 15
Pennsylvania Seed Leaf	" 20	42	" 20	53	" 15
Total weight		300		389	
Series II.—					
White Burley	July 26	78	July 26	71	Sept. 3
Yellow Oronoko	" 26	43	" 26	53	" 15
" Pryor	" 26	46	" 26	52	" 15
Cannelle		14	" 26	14	" 15
Connecticut Seed Leaf		66	" 26	69	" 15
Persian Rose		32	" 26	30	" 15
Pennsylvania Seed Leaf		70	" 26	74	" 15
Total weight		349		363	
Series III.—					
White Burley	Aug. 2	71	Aug. 2	104	Sept. 3
Yellow Oronoko	" 2	53	" 2	55	" 15
" Pryor	" 2	50	" 2	53	" 15
Cannelle	" 2	16	" 2	20	" 15
Connecticut Seed Leaf	" 2	69	" 2	72	" 15
Persian Rose	" 2	25	" 2	27	" 15
Pennsylvania Seed Leaf	" 2	63	" 2	80	" 15
Total weight		347		411	

REPORT OF THE CHEMIST.

(Frank T. Shutt, M.A., F.I.C., F.C.S.)

Ottawa, 30th November, 1897.

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the eleventh annual report of the Chemical Division of the Dominion Experimental Farms.

Though much of the scientific work commenced during the past year is not yet completed—notably, the investigations in the matter of the preservation of barn-yard manure, and in the feeding value of certain grasses—we are able to present for the information of our readers in the present report some new and important results bearing directly upon the practice of Canadian agriculture. As in the past, it has been our endeavour to make the Chemical Division one of practical value to the farmer, dairyman and fruit grower, and it is believed that the experiments undertaken and now reported upon are such as to commend themselves as important to those who are following agriculture in one or other of its branches. While every investigation has been undertaken from this point of view, scientific accuracy and thoroughness have not been sacrificed, believing that all true progress and material development can only come from work marked by these qualities.

The work of the Chemical Division in all its branches continues to increase. As the objects of the Experimental Farm system and the value of chemical science as applied to agriculture become better known, the requests for analyses and for information, naturally, become more and more numerous. This fact, though exceedingly encouraging as pointing to an increasing appreciation on the part of our farmers, makes it highly desirable, and indeed necessary, to add to the chemical staff and enlarge our facilities, if we are to keep pace with these demands, more especially when we remember that original investigation should have the first call on our time.

A brief résumé of the more important subjects treated of in the present report may be given as follows :—

Clovers and green manures.—This investigation, begun in 1895, to ascertain the amounts of fertilizing materials that under different conditions could be supplied to the soil by various clovers, has been during the past season further pursued. We are able to place before our readers in the present report some very interesting and important data regarding the value of soil enrichment by growing clover with the cereal crop.

Soil inoculation for the legumes with nitragin.—Our results in this new department of agricultural research will be found of special interest. They indicate the possibility of economically treating land with germ cultures to stimulate the growth of clover and assist in assimilation of free (atmospheric) nitrogen. An illustration, taken from a photograph of the pots under experiment is given. The luxuriance of the foliage in the inoculated soils, in comparison with that in the untreated pots, is apparent. The chemical data, showing the amounts of nitrogen, organic matter, and ash in the (*a*) roots, and (*b*) stems and leaves of the clovers and horse beans experimented with, are presented in tabular form.

Forage plants and fodder.—These include Awnless Brome grass, of which analyses have been made of the hay grown at the Experimental Farm, Indian Head, N.W.T., and cut at different stages of growth ; Alfilaria or Cranebill, a forage lant found in British Columbia ; and a number of milling products, *e.g.*, buckwheat bran and provender.

Soils.—For lack of the necessary time, we have been obliged to postpone our investigation upon the virgin soils of the Dominion. We have, however, continued, as far as opportunity permitted, to examine samples sent in by farmers. Such work usually consisted in a determination of the humus, nitrogen and lime and the relative proportions of clay and sand. These data do not allow us to state the amounts of available plant food present, but they have enabled us to arrive at the general character of the soils and to indicate methods for their economical improvement.

A certain number of reports upon such samples are here inserted, in order to show the practical character of the information thus afforded farmers, and also in the hope that the deductions and advice thus given will be of value to our agricultural readers.

The results of analyses of virgin soils, obtained in our laboratories during the past nine years have been collated and made strictly comparable. They were presented in the form of a paper to the Chemical Section of the British Association at their convention in Toronto in August last. Since the information this paper contains will be found useful for reference by those interested in Canadian soils, it is herewith appended.

Naturally-occurring fertilizers.—Mucks, muds and marls. We have found it quite impossible to analyse all the samples of these materials sent in during the past year. Those samples, however, as far as time allowed, have been examined which, being from new localities, &c., appeared to merit special attention. The composition of these is here given, together with deductions as to their use and fertilizing value.

Miscellaneous fertilizing materials.—In this chapter we report upon the amount of plant food, as found by analysis, in various bye-products and weeds, *e.g.*, lobster refuse from the canning factories ; ashes from lime kilns, and that difficult-to-eradicate weed, purslane or pusley.

Moss litter. The examination of two samples of moss litter from Nova Scotia has been made. The results are confirmatory of those published in the report of this Division for 1895, obtained from moss collected in New Brunswick. Both samples were of excellent quality and specially adapted for bedding purposes, possessing high absorptive capacity. A new use for this material has been found. It is said to be most satisfactory as a packing material for fruit, fish and other perishable substances. Its elasticity makes it desirable for such purposes from a mechanical standpoint, and its power to absorb moisture and noxious gases renders it valuable as a preservative.

Well waters from farm homesteads.—We append in tabular form the data obtained from the examination of 63 samples, together with a brief report as to their quality.

It should be distinctly understood that the samples from *farm homesteads only* can be examined. The printed instructions issued by the Farm should be obtained before sending a water for analysis, since the probability is that otherwise a mistake will be made respecting the quantity required or in the matter of collection and shipment.

Tuberculin.—During the twelve months ending November 30, 1897, 214,018 minims of diluted tuberculin, a quantity sufficient to test 3,567 adult cattle, have been prepared and forwarded. The greater part of this has been sent out within the past three months, interest in the question of tuberculosis in cattle, more especially in those furnishing milk for town supply, having of late been very keen. This tuberculin is furnished to veterinarians by order of the Department of Agriculture. The labour involved in this work has been very considerable and necessarily has encroached largely on the time of this Division. We have in consequence not been able to accomplish as much purely chemical work as otherwise it would have been possible to overtake.

Samples received for Analysis.—The following table gives the details of the samples received from farmers during the past year.

SAMPLES received from Farmers for Examination and Report, November 30, 1896, to November 30, 1897.

—	British Columbia	North-west Territories.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.
Soils...	7	...	.....	12	23	5	..	....	47
Naturally-occurring fertilizers (mucks, mud, and marls)...	2	.....	1	5	4	3	8	20	43
Manures and fertilizers...	4	.....	.....	5	2	1	4	5	21
Forage plants and fodders...	1	8	....	5	...	2	1	.....	17
Well waters...	4	7	......	33	15	7	...	19	85
Miscellaneous, including dairy products...	3	4	.....	31	19	4	9	6	76
	21	19	1	91	63	22	22	50	289

It has been quite impossible with the present staff to submit all these to analysis, but as far as time allowed such as were deemed most important have been reported upon, as follows: Soils, 28; naturally-occurring fertilizers, 29; manures, 5; forage plants and fodders, 13; well waters, 68; miscellaneous, including dairy products, 41. The rest await an opportunity for examination. This branch of our work is evidently one that is much appreciated by farmers, and further expert assistance in the laboratory will be necessary if the privileges in this direction are to be extended in the future.

Mineral Specimens.—A very large number of mineral specimens have been received for identification and assay during the past year. The chemical work of the farms is necessarily restricted to matters relating to agriculture and we would, therefore, advise our readers that we cannot undertake to report on such samples.

Correspondence.—For the twelve months past the letters received by this Division number 1,248; those sent out, 1,402. The correspondence is principally from farmers, dairymen and fruit growers, and relates to soils, fodders, fertilizers and other matters of agricultural importance. As it becomes more widely known that questions may be sent, this branch of our work naturally increases.

Meetings attended.—Since November 30, 1896, the more important conventions attended and meetings addressed, include the following:—

The Association of Official Agricultural Chemists, at Washington, D.C.

The Farmers' and Dairymen's Association of New Brunswick, at Fredericton, N.B.

Farmers' Institute Meetings at Jeffries and Penobsquis, N.B.

The British Association for the Advancement of Science, at Toronto.

The Central Canada Agricultural Association, at Montreal.

The Fruit Growers' Association of Quebec, at Howick, Que.

Farmers' Institute Meetings at Summerside, Charlottetown, Georgetown and Alberton, P.E.I.

Two lectures, entitled "The principles of Plant feeding" and "The principles of Animal feeding," were delivered before the students of the Normal School, Ottawa.

Mr. Henry S. Marsh, Associate of the Institute of Chemistry, has continued to efficiently discharge the duties of Assistant Chemist, and to him my thanks are due for much careful work and many of the analytical data contained in this report.

I have the honour to be, sir,
Your obedient servant,

FRANK T. SHUTT,
Chemist, Dominion Experimental Farms.

CLOVERS AS GREEN MANURES.

THE FACTORS OF SOIL FERTILITY.

A high degree of soil fertility or crop-producing power is one of the fundamental factors in profitable farming. It, therefore, becomes of the greatest, indeed of paramount, importance to understand the nature of what constitutes fertility in a soil.

First, the soil must contain at least certain minimum amounts of mineral matter, such as potash, phosphoric acid and lime, and these constituents, or rather a certain percentage of them, must be in a more or less readily assimilable condition ; for in this connection it is well to point out that by far the larger proportion of the fertilizing elements present in a soil is in locked-up or insoluble combinations. Plant food from the soil is absorbed and appropriated by crops in the form of a solution, and consequently such compounds as are insoluble, or are not capable of solution by the soil water or the exudations of plant rootlets, are valueless from an agricultural standpoint.

Secondly, a soil to be fertile must be possessed of nitrogen and humus. The latter term is applied to semi-decomposed organic matter, arising from the partial decay of roots and vegetable tissues generally. The nitrogen is in combination with this organic matter and is converted into forms useful to plants (nitrates) by a process known as nitrification. This conversion is the work of certain microbes, or microscopic plants which live on humus. Their development is in a large measure regulated by the amount of humus present, the degree of soil moisture, the soil's temperature, and the percentage of salifiable bases, such as lime and potash, present to combine with the nitric acid as formed. Permeability of the soil to air is also necessary.

Thirdly, fertility depends upon a right mechanical condition of the soil. This is sometimes known as tilth. It should be such that air may readily permeate and rain easily penetrate the soil. Roots and rootlets should be able to find an easy passage in foraging for food. Drainage and good cultural methods are essential in bringing about good tilth.

Fourth, certain conditions of climate are necessary for the best results. Warmth, sunshine and rainfall are all potent influences on crop production.

GREEN MANURING FOR INCREASING SOIL FERTILITY.

The system of green manuring, as practised by turning under a green crop of clover, increases fertility in a greater or less degree by the means named in the first three counts. While it does not add to the total amount of mineral plant food in the soil, the growth of the clover converts a large portion of such into compounds which, upon decay or rotting of the crop, are more readily assimilable for future use. This is certainly of no small value.

The feature of special importance, however, is that the decay of the clover enriches the soil in nitrogen and organic matter—a distinct gain, since all the elements of the latter, and the greater portion of the former, have been appropriated by the clover plant from the atmosphere. This organic nitrogen, as it may be termed, is readily transformed, in the presence of lime or potash and under favourable conditions of climate, into nitrates, the compounds which ordinary farm crops draw upon for their supply of nitrogen. As much nitrogen can be furnished per acre by ploughing down a crop of clover as would be furnished by an application of 10 to 15 tons of barn-yard manure. Again, the addition of the large amount of humus by a crop of clover vastly improves the texture of the soil, opening up and making warmer a clay loam and rendering a sandy soil more absorptive.

There are other benefits accruing from this system of manuring, but, in addition to those just discussed, attention need now only be directed to the following:—During the hot months of summer the process of nitrification goes on rapidly. The nitrates so

formed are extremely soluble and consequently may in a large measure be lost by the leaching of autumn rains, when the crop grown has matured and been harvested early. The cereals are comparatively short-lived crops, and, therefore, the value of sowing clover with them and thus having the ground covered, after the former have been cut, with vegetation that can utilize these nitrates is apparent. The late summer and autumn rains then assist in the storing up of these valuable nitrogenous compounds rather than in their dissipation.

A further advantage in sowing the clover with the cereals is in keeping down weeds after the grain is harvested.

SOWING CLOVER WITH BARLEY.

It will be remembered that in the report for 1896 we recorded the results of an experiment carried on with various clovers as "cover" crops for orchards, stating their relative merits for this purpose and giving their analyses in detail. The figures showed that large quantities of fertilizing materials and humus can be furnished the soil by ploughing under the crop in the autumn.

In the present report we give the results of a further investigation, the clovers having been sown at various rates per acre with barley, and the roots and dead stems and leaves of the clovers being collected for analysis in the following spring. The barley employed was that known as Odessa, which was sown on all the plots under experiment at the uniform rate of $1\frac{3}{4}$ bushel per acre. The barley and clover were sown together on all the plots on 5th, May 1896, and the barley cut on 27th July. The clover residues (that is, the roots, dead stems and leaves) were collected on May 1st, 1897.

The results, therefore, indicate the amounts of organic and mineral matter and certain fertilizing constituents contained in the roots to a depth of 9 inches, and in the dead or dried stems and leaves, immediately before spring ploughing.

The data are presented in tabular form, as follows :—

ANALYSES of clover residues (roots, dead stems and leaves), 1897.

All the clovers were sown, at the respective rates mentioned below, on 5th May, 1896, with Odessa barley at the rate of $1\frac{3}{4}$ bushel per acre. The barley on all the plots was cut 27th July, 1896. The clover residues (roots, dead stems and leaves), were collected 1st May, 1897.	Composition. Water.	Organic Matter.	Ash.	Nitrogen.	Weight of Clover residue, per acre.		Amount of certain constituents, per Acre. Organic Matter.	Ash.	Nitrogen.
				p. c.	Tons.	Lbs.	Lbs.	Lbs.	Lbs.
Mammoth red clover, sown 14 lbs. per acre.	71·51	24·45	4·04	·903	3	636	1,622	268	59
" " " 12 "	69·73	25·28	4·99	1·109	3	976	1,762	349	77
" " " 10 "	59·43	33·19	7 38	1·417	2	1,955	1,978	439	81
" " " 8 "	70·00	26·18	3·82	1·123	3	976	1,783	258	76
" " " 6 "	72·00	24·00	4·00	1·041	3	806	1,634	272	70
" " " 4 "	63·34	31·74	4·92	1·260	2	594	1,458	226	58
Common red clover " 10 "	72·50	23·61	3·89	1·016	3	125	1,446	238	62
Alsike clover " 6 "	71·58	22·63	5·79	1·020	1	1,233	732	187	33
Alfalfa " 14 "	61·54	34·79	3·67	1·075	1	212	772	79	26
Crimson clover " 24 "	62 82	33·01	4·17	·827		1,322	478	60	12

Field notes regarding the growth and appearance of the clovers at certain stages of growth, are to be found on pages 37 and 38 of the Annual Report of the Farms for 1896.

MAMMOTH RED CLOVER.

Considering briefly the data of the foregoing table, we notice first that as regards nitrogen, the greatest amount was found in the residue of the Mammoth Red clover, sown at the rate of 10 pounds per acre. Above and below this rate of seeding, the quantity of nitrogen decreased. Allowing for the unavoidable errors of experiment, the trials with clover sown at the rate of 12, 8 and 6 pounds, respectively, per acre, gave approximately the same amount of this element, averaging from 5 to 10 pounds less than in the residue from 10 pounds of clover seed per acre. That sown very thickly, 14 pounds, and that very thinly, 4 pounds, are seen to contain, practically, the same amounts.

The greatest weights of organic matter and ash constituents were also contained in the residue from 10 pounds of seed per acre. The reason that it appeared to yield a smaller total weight than that of the others of this series (save that sown at 4 pounds per acre) was that on analysis, it was found to contain from 10 to 13 per cent less water than they.

On all three counts, therefore, we may conclude that the maximum benefit as a green manure was obtained by seeding this clover at the rate of 10 pounds per acre.

The fertilizing value of the residues from 14 pounds and 4 pounds are, somewhat strangely, almost identical.

Of the other clovers experimented with, the Common Red clover makes the best showing, and the Crimson clover the poorest, with Alsike and Alfalfa intermediate in the order named.

If we leave out of consideration all the advantages accruing from this system of manuring, save the accumulation of nitrogen, and suppose that Mammoth Red clover sown at the rate of 8 to 10 pounds per acre can appropriate from the atmosphere, say 50 pounds of this element (the rest being obtained from the soil), the economy and profit of this method of supplying nitrogen by sowing clover with a grain crop for increasing the fertility of soils become apparent. In this connection it may be well to remark that the growth of the clover did not, on any of the plots, diminish the yield of grain.

The question arises as to whether the clover crop, when grown solely for the purposes of enriching the soil, should be ploughed under in the autumn or the spring. Comparing the results given in last year's report with those now recorded, the conclusion must be drawn that greater benefit is derived by ploughing under in the autumn. The investigations were not on parallel lines, so that a close comparison cannot be made, but nevertheless there is such a large difference between the weights of essential constituents in the crop in the autumn and the spring—the difference being in favour of the former—that little room is left for doubt on this point. Moreover, the crop in the autumn is green and succulent, and we have, therefore, every reason to suppose that its decomposition and the subsequent setting free of its elements of plant food would proceed more rapidly than the decay of the organic matter in the dead and dried residue which is to be found the following spring.

The work so far, then, makes evident the advantage of growing a nitrogen-collector (one of the legumes) with the grain crop. The results of the past season show that the greatest benefit was obtained from sowing 8 to 10 pounds of Mammoth Red clover per acre, and favour the ploughing under of the crop at the close of the growing season —in most localities about the middle of October.

SOIL INOCULATION FOR THE GROWTH OF THE LEGUMES.

THE USE OF NITRAGIN IN AGRICULTURE.

Though not generally practised as a means of soil enrichment, it has been known for many centuries that the growth of clovers and other members of the Pulse family, now commonly termed legumes, increased rather than diminished the fertility of the soil, so that the yield of grain after a crop of clover was greater than it would have been without a previous seeding of clover. The theory generally accepted was that the clover being a deep rooted plant brought up from the sub-soil mineral matter that was out of the reach of other farm crops. This, however, appears to be but one of the causes —and that a minor one—for the fact above mentioned. The chief reason, as revealed by a recent scientific discovery, lies in the fact that the legumes can appropriate the free nitrogen of the atmosphere, assimilating and building it up into their tissues. This nitrogen, by the decay of the roots (and foliage, if the crop is ploughed under) may be utilized, after the process of nitrification, by subsequent crops. As far as we are at present aware the legumes only have this power, hence they are known as nitrogen-collectors in contradistinction to all other crops, which are known as nitrogen-consumers. The demonstration that the free, that is uncombined, nitrogen of the atmosphere can be so utilized by the legumes is due to Hellriegel, a celebrated German scientist. He, with his equally renowned colleague Wilfarth, made this announcement to the world in 1886, at the same time giving overwhelming proof of the correctness of the assertion and explaining the way in which this appropriation and assimilation takes place. The discovery was not only a brilliant scientific achievement, but one of the greatest importance to the agricultural world.

In explaining the fact of this discovery and the application to practical agriculture, it may first be pointed out that the legumes have not in themselves the power of free nitrogen assimilation ; in this respect all plants are alike. They can, however, utilize atmospheric nitrogen through the agency of certain micro-organisms present in the soil. These micro-organisms, microbes or bacteria attach themselves to the roots of the legumes upon which nodules or tubercles then form. These contain the microbes. In some way, at present not well understood, the latter can absorb the nitrogen of the air occupying the instertices between the soil particles, converting it into certain nitrogenous compounds that enter the sap circulation of the host plant and finally are stored up in the tissues. When the nodules and their inhabitants are not present in the soil, clover, pease and all other legumes must, like the rest of vegetation, obtain all their nitrogen from the supply in the soil existing there as nitrates.

Now, it is to be noted that these micro-organisms, though very widely distributed, are not found in all soils. The question, therefore, of the possibility of introducing them where absent, or present only in small numbers, becomes one of agricultural importance. Further, if soil inoculation (as such a process may be well called) is possible, can it be made an economical method for enriching the soil with nitrogen? These are questions that come well within the scope of scientific agriculture to investigate, questions well worthy of careful research, for the answers must be of the greatest importance to farmers.

It might, at the outset, be supposed that the soil of a field growing a luxuriant crop of clover, the roots of which possess nodules, would in all probability contain large numbers of these organisms. Naturally, therefore, we find the first experiments consisted in taking soil from a field upon which a legume possessing an abundance of nodules had been grown and scattering it on the field to be impregnated. This was practically soil inoculation, and though the plan in many instances proved eminently satisfactory, the carrying out of it was frequently costly and cumbersome. Dr. Nobbe, of Tharand, Saxony, was the one who first made this practical application of Hellriegal's discovery.

The next step, also taken by Dr. Nobbe, was in the isolation of the nitrogen-converting microbes from such soil and the preparation, by certain well known bacteriological methods of "pure cultures." These cultures consist of colonies of the organisms and the preparation has been named *Nitragin*

It would appear that the members of the leguminosæ have each their own peculiar bacterium or micro-organism, for it seems that those influencing the assimilation of nitrogen in the clover plant are of no value for the pea crop, and *vice versa*. Hence, the necessity for the preparation of clover "nitragin," pea "nitragin," &c. These cultures or bacterial preparations, to the number of 17, are now manufactured on a commercial scale in Germany, and a quantity of each said to be sufficient to inoculate an acre can be procured for about $1.25.

The practical application of *Nitragin* has been made in two ways; first, by diluting the preparation with sufficient water and sprinkling the seed with the fluid, and, secondly, by treating a quantity of soil with a dilute solution of the preparation, allowing the soil to dry, and then spreading it evenly over the field to be inoculated, which is then deeply harrowed.

Following these methods, experiments have been made in Germany, England and on this continent. The results so far obtained, as gathered from the reports of these investigations, scarcely admit of any more emphatic statement than that the indications are that on soils that have not previously grown legumes, or for other reasons do not contain the nitrogen-assimilating bacteria, the practice of inoculation will be attended with profit. Some soils contain such an abundance of these microbes that a further supply is unnecessary. European field experiments seem to show that even when the growth of the foliage is not increased by *Nitragin* there is frequently a greater root development and a larger number of nodules. No great difference could be noted, in these reports, between the results of soil inoculation and seed inoculation, though such differences as there are appear to be in favour of the former.

EXPERIMENTS WITH NITRAGIN.

In the spring of the present year we obtained from Messrs. Meister, Lucius and Bruning, Höchst am Main, manufacturers of bacterial cultures, *Nitragins*, for alfalfa or lucerne, clover, horse beans and vetch. The soil used in our experiments was made from clay, sand and swamp muck and would be termed a loam of medium fertility. It was not sterilized, in order that the conditions might be comparable, as far as possible, to those on the farm. The experiments were conducted in duplicate in galvanized iron pots and the methods of inoculation above described were employed, check, or uninoculated, pots being sown at the same time. After the plants had reached the height of a few inches they were thinned out to the same number in each pot. The seed in all the trials was sown on May 20th, 1897, the plants of the clover, alfalfa and vetch showing above ground in all the pots on May 25th, and the horse beans on May 31st. The soil and seed of the inoculated tests were treated with the respective *Nitragins* on the day of sowing, May 20th.

Unfortunately, the growth of the alfalfa and vetch was very meagre and it was, therefore, deemed inadvisable to weigh and analyse their crop, as the results might be misleading.

INOCULATION EXPERIMENTS WITH HORSE BEANS (FABA VULGARIS, var. EQUINA).

(Sown 20th May, collected 4th August, 1897.)

The plants were thinned out to five (5) in each pot. On August 4th, the plants being then in pod, the experiment was brought to a close. The difference in foliage in the various pots was not very marked, though the plants in the pots containing the inoculated soil (H.H.) were decidedly larger and more robust than the others. In all the pots the plants appeared healthy.

In the check, or uninoculated pots, the root systems were meagre and supplied with a few small nodules only.

In the "soil inoculated" pots there were extensive root systems, the fibres being possessed of numerous nodules of a much larger size than in the preceding series.

In the pots containing the plants grown from "inoculated seed" the root systems, though larger than in the uninoculated pots, were not equal to those in the soil inoculated pots, nor were the nodules quite so numerous.

The results showed that the *Nitragin* had a decided effect in the development of the roots, a feature that has been remarked upon by Dr. Voelcher, an English agricultural chemist, who has carried on a series of investigations with *Nitragin.*

The weight of the roots, stems and leaves on August 4th were as follows:—

			Grams.
Pots G.G.,	uninoculated,	10 plants, including roots.........	127
Pots H.H.,	soil inoculated,	10 plants, "	227
Pots I.I.,	seed inoculated,	10 plants, "	157

The following table presents the analytical data, including the amounts of certain constituents contained in the plants under experiment :—

TABLE I.

AMOUNTS OF NITROGEN, ASH CONSTITUENTS AND ORGANIC MATTER.

—	Pots G.G. 10 Plants = 127 Grams. Not Inoculated.			Pots H. H. 10 Plants = 227 Grams. Soil Inoculated.			Pots I. I. 10 Plants = 157 Grams. Seed Inoculated.		
	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.
Weight of nitrogen......	·611	·145	·756	·822	·281	1·103	·569	·267	·836
" ash or mineral matter......	2·56	2·64	5·20	2·94	4·44	7·38	2 35	4·14	6·49
" organic matter	16·49	3·67	20·16	22·57	7·66	30·23	14·53	7·56	22·09
Total dry matter..	19·05	6·31	25·36	25·51	12·10	37·61	16·88	11·70	28·58

Deductions.—(A.) The largest yield of crop was obtained from the soil inoculated pots H.H., chiefly due to the greater weight of roots.

(B.) The amounts of nitrogen, ash or mineral matter and organic matter in the plants from pots H.H., soil inoculated, were, in most instances, considerably greater than those from the inoculated seed pots I.I.

(C.) The plants from pots I.I., "seed inoculated," furnished nitrogen, ash constituent and organic matter in amounts intermediate between those from G.G., not inoculated, and H.H., seed inoculated.

We may, therefore, conclude that in this experiment there has been a decided advantage accruing from the use of *Nitragin*, especially when employed for "soil inoculation," and that "seed inoculation," while not giving such marked results, has nevertheless been beneficial in increasing the growth. I further think we may fairly conclude that the additional nitrogen in the plants of the pots H.H. and I.I. has been obtained through the agency of the *Nitragin.*

TABLE II.

THE PERCENTAGE COMPOSITION OF THE "DRY MATTER" OF THE (*a*) STEMS AND LEAVES, AND (*b*) ROOTS OF THE PLANTS.

	From Pots G.G. Not inoculated.		From Pods H.H. Soil inoculated.		From Pots I.I. Seed inoculated.	
	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.
Nitrogen	3·212	2·321	3·223	2·324	2·936	2·478
Ash or mineral matter	13·46	41·91	11·52	36·76	12·33	40·49
Organic matter	86·54	58·09	88·48	63·24	87·67	59·51

The data do not allow of the deduction that the plants from inoculated soil or seed are relatively richer in nitrogen than those without *Nitragin*. The larger amount of nitrogen in the treated crop is rather due to a greater development of root or foliage, or both, under the stimulating effect of the micro-organisms furnished by the preparation.

The percentages of ash or mineral matter are not to be compared too closely, as by the method employed it was found extremely difficult to separate the last traces of sand upon the roots. The presence of a small amount of sand would materially increase the percentage of "ash."

MAMMOTH RED CLOVER.

Culture used, "Trifolium pratense." The plants were thinned to 10 plants in each pot. The experiment was closed on October 22nd, when a few of the plants were in flower. Previous to the weighing of the plants a photograph of the series was taken, a reproduction of which is here given.

		Grams.
Pots D.D., Not inoculated, weight of plants, including roots	...	147·6
Pots E.E., Soil inoculated,	do ...	163·2
Pots F.F., Seed inoculated,	do ...	189·0

These data show that considerable increase in weight of crop has resulted from the action of the *Nitragin*, though it is to be remarked that, unlike the results with the horse beans, the greater yield is obtained from the experiment in which the seed was inoculated.

The nodules or tubercles were much smaller than those on the roots of the horse beans. From mere inspection of the roots it was extremely difficult to decide which series was the richest in nodules. The root systems, as regards development, were approximately in the ratio represented by the total weight of the crops.

Illustration showing the method of collection of the roots, dead stems and leaves of clover for analysis, May 1st, 1897.

Inoculation experiments with *Nitragin* for Mammoth Red Clover, Sept. 17th, 1897. Pots D. D., not inoculated; Pots E. E., soil inoculated; Pots F. F., seed inoculated.

The analytical data of this series are given as follows :—

TABLE III.

AMOUNTS OF NITROGEN, ASH CONSTITUENTS AND ORGANIC MATTER.

—	Pots D.D. 20 plants=147·6 grams. Not inoculated.			Pots E.E. 20 plants=163·2 grams. Soil inoculated.			Pots F.F. 20 plants=189·0 grams. Seed inoculated.		
	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.
Weight of nitrogen.....	·602	·469	1·071	·740	·495	1·235	·800	·745	1.545
" ash or mineral matter.	5·18	9·76	14·94	4·98	5·14	10·12	4·66	6·84	11·50
Weight, organic matter..	21·42	10·24	31·66	26·22	14·36	40·58	27·04	20·06	47·10
" "dry matter"	26·6	20·00	46·60	31·20	19·50	50·70	31·70	26·90	58 60

Again, it is to be noticed that the amounts of nitrogen increase with the total weight of the crop; the same is also true of the organic matter. In these important constituents, larger quantities were obtained from the treated pots than from the untreated or check pots, and thus we have further testimony to the favourable action of the bacterial culture. It is worthy of note that the roots contained amounts of fertilizing constituents to the extent of at least two-thirds of those present in the foliage.

The percentage composition of the "dry matter" of the clovers under experiment is presented as follows :—

TABLE IV.

PERCENTAGE COMPOSITION OF "DRY MATTER."

	From Pots D.D. Not inoculated.		From Pots E.E. Soil inoculated.		From Pots F.F. Seed inoculated.	
	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.
Nitrogen..........	2·26	2·31	2·37	2·54	2·53	2·77
Ash or mineral matter.............	19·46	25·40	15·91	26·39	14·71	25·47
Organic matter.....	80·54	74·60	84·09	73·61	85·29	74·53

Slightly larger percentages of nitrogen were found in the inoculated plants, and more especially in their roots, than in those untreated, in this respect differing from the results obtained with the horse beans. The percentages of the other constituents are practically the same throughout the series.

Further experiments with *Nitragin* will be made next season. With increased data at our command we shall probably be in a position to speak more decisively as to the value of this preparation. The indications of the present investigation, however, point

strongly to its usefulness in encouraging the growth of the legumes, clover and horse beans; and it is probable that where such will not grow luxuriantly, owing to the absence of the necessary microbes in the soil, inoculation with *Nitragin* will prove effective and economical.

FORAGE PLANTS AND FODDERS.

AWNLESS BROME GRASS (*Bromus inermis.*)

In bulletin No. 19, Grasses; their uses and composition (Experimental Farm series), written by Dr. Fletcher and myself in 1893, the following statement regarding Awnless Brome Grass is to be found: "We consider this to be one of the most valuable of the introduced grasses, both from its feeding qualities, as evinced by analysis, and from its free, luxuriant habit of growth. An analysis made from grass grown on the Central Experimental Farm, afforded the following data:—

ANALYSIS of Awnless Brome Grass, taken when the seed was fully formed, the right period at which to cut for hay.

——	Fresh or Green Grass.	Calculated to Water-free Substance.
Water	65·07	
Ash	1·32	3·78
Protein (albuminoids)	4·14	11·88
Fat (Ether Extract)	·84	2·41
Carbohydrates (Nitrogen-free extract)	16·90	48·03
Fibre	11·73	33·90
	100·00	100·00

These results denote that it is a grass rich in flesh-forming substances (protein) and low in fibre—the least valuable, from a feeding standpoint, of a fodder's constituents.

In the Annual Report of the Experimental Farms for 1893, on page 189, Dr. Fletcher, Botanist of the Experimental Farms, speaks very highly of this grass from trials made under his care on the Central Farm, stating that it is early and hardy, and that it is a heavy cropper, and one which produces an excellent aftermath of succulent, leafy shoots. He also quotes many favourable opinions from those who have grown it in the North-west Territories and the United States.

For several years it has been extensively sown on the Experimental Farms at Brandon and Indian Head, and reference to the reports from these farms for last year will show that great success has attended the trials on both farms (see pages 337 and 396, Report Expl. Farms, 1896). Both for hay and pasture it has already proved a most valuable grass for the North-western provinces. A feature of particular importance is the heavy aftermath of succulent grass it affords. Since the native grasses do not produce this secondary growth to any extent, Brome grass is extremely valuable in furnishing for the farmer and dairyman of these districts, during the late summer months, palatable, wholesome and nutritious feed for keeping up the milk flow.

In order to give the grass an extensive introduction, it was considered desirable to distribute seed among farmers. To obtain this, portions of the crop on the Experimental Farms at Brandon and Indian Head have been allowed to ripen, and the hay thrashed. Many farmers have also followed this practice to procure seed for themselves and their neighbours and thus, frequently, farmers have a quantity of fully ripe, thrashed hay to feed to stock. To ascertain the value of this latter, or in other words to learn what deterioration in feeding value has taken place between the period at which the grass is in prime condition for cutting and that at which the seed is fully ripe, the

following investigation was carried out, the samples being furnished from the Experimental Farm at Indian Head, N.W.T., by Mr. Mackay, the superintendent :—

The samples consisted of (1) hay cut when the seed was formed (July, 13, 1896) and considered in prime condition, (2) hay cut when seed was fully ripe (July, 24, 1896) and containing seed, (3) ripened, thrashed hay (practically straw), and (4) chaff from the thrasher, containing some seed. Samples 1, 2 and 3 were of good colour, not having been bleached in the curing, a change usually accompanied by a lessening of food value, the fibre becoming hard and indigestible. The appearance of all was that of nutritious, palatable hay.

ANALYSES of Hay and Chaff of Awnless Brome Grass.

Number.	Stage of growth, &c.	Hay.						Calculated to Water-free Substance.				
		Water.	Ash.	Protein, (albuminoids).	Fat (ether extract).	Carbo-hydrates (nitrogen-free extract).	Fibre.	Ash.	Protein (albuminoids).	Fat (ether extract).	Carbo-hydrates (nitrogen-free extract).	Fibre.
1	Seed just formed; in prime condition for hay; cut 13th July, 1896	6·47	7·87	7·54	4·14	42·56	31·42	8·42	8·10	4·42	45·46	33·60
2	Seed ripe; unthrashed; cut 24th July, 1896	8·28	7·39	5·76	3·15	43·16	32·26	8·05	6·28	3·43	47·07	35·17
3	Ripened; thrashed; hay (straw)	7·62	7·23	6·05	3·80	38·75	36·55	7·83	6·35	4·11	42·15	39·56
4	Chaff from thrasher, containing some seed	8·63	9·01	10·70	4·86	42·88	23·92	9·86	11·21	5·32	47·42	26·19

In the first place we notice that of the three samples of hay, No. 1 (that cut when "the seed was just formed") is the most nutritious, since it contains most protein and fat and the least fibre. This result is in accord with those already obtained from a study of other grasses (see bulletin No. 19, page 22) and emphasizes the importance of cutting for hay as soon as the seed has formed. A loss of valuable and digestible food material always occurs when a grass is allowed to fully mature before it is cut for hay.

Thus, on comparing the analysis of Nos. 1 and 2, it is evident that a certain deterioration in food value has taken place by the ripening of the grass. This depreciation in nutritive qualities, made apparent by contrasting the figures in the columns representing the composition of the water-free substances—is not, however, in this instance a very serious one; at all events, it is not so great as to prevent the farmers from allowing the grass to mature when a supply of seed is wished.

Though the ripened, thrashed hay (No. 3) contains more fibre and somewhat less starch, &c. (carbohydrates) than the unthrashed hay (No. 2) our data do not show that there is any great difference in feeding value between these samples. Indeed it would appear that in certain respects the former is the better of the two. This is contrary to our expectation and is perhaps caused by the loss in thrashing of certain of the least valuable portions of the plant.

Sample No. 4, labelled "chaff from the thrasher," evidently contained a considerable amount of seed. Its presence in the chaff is most probably unavoidable, and may be accounted for by the extreme lightness of the seed. Our analysis shows this sample to be the richest in protein and fat and lowest in fibre of all those examined. This is undoubtedly good fodder and one that could be used to advantage as part of the daily ration.

STORKSBILL OR ALFILARIA *(Erodium cicutarium.)*

At the request of Mr. J. R. Anderson, Deputy Minister of Agriculture for British Columbia, a chemical examination of the feeding qualities of this forage plant has been made. Concerning its occurrence in that province, Mr. Anderson writes as follows :—"Erodium cicutarium is common in the vicinity of Victoria and on the Gulf Islands,

but I am not prepared to state its prevalence in other parts of the province. It is generally found on rocks thinly covered with soil, as a small plant, but it readily accommodates itself to more congenial localities, where it assumes the large form I send you. It thrives best in a rich black loam. It has not been grown as a crop and its weight per acre is, therefore, unknown; from what I have seen of it however, I should think the yield would be about the same as that of red clover. Cattle, according to Mr. Munro, eat it with avidity, at any rate, during the winter months when green food is scarce."

Our analysis of the sample sent furnished the following data:—

COMPOSITION OF STORKSBILL OR ALFILARIA.

Constituents.	Green Material.	Hay (Air-dried.)
Water	89·02	10·32
Albuminoids (protein)	2·81	23·12
Ether extract (fat)	·55	4·53
Nitrogen-free extract (carbo-hydrates)	3·79	30·70
Fibre	1·34	10·97
Ash or mineral constituents	2·49	20·36
	100·00	100·00

These results show that this plant has nutritive qualities of a high order. The percentage of albuminoids (flesh formers) closely approximate that found in good grasses, though it must be remembered that in the young plant a part of the nitrogen (the essential element of albuminoids) exists in the form of amides—compounds which have not quite the same feeding value as the true albuminoids. Another feature in its favour is the particularly small amount of fibre it contains. Provided the plant is palatable to cattle, which upon good testimony it appears to be, it should prove a nutritious, wholesome fodder.

Storksbill or alfilaria evidently makes a large draft upon the mineral resources of the soil, for the ash content is high. This should not be considered as a disadvantage, if the manure from its feeding is carefully preserved and returned to the soil, for provided these precautions are observed this and similar plants may be used as agents for converting locked-up plant food into available forms for future crops.

Regarding the value of this plant, it will be of interest to make the following quotations from "The Agricultural Grasses and Forage Plants of the United States," by Dr. Geo. Vasey:—"This annual, supposed to have been introduced from Europe, does not seem to be mentioned in any work on forage plants. It occurs abundantly and is of much value for pasture over a large extent of territory in Northern California and adjoining regions; elsewhere in the United States it is sparingly introduced and usually regarded only as a weed, though it is not very troublesome. Besides the above name it is known as Storksbill, pin clover, pin grass, and filaree; it is neither a clover nor a grass, but belongs to the geranium family; it starts very early and grows rapidly, furnishing good, early pasture and ripens seed before the hottest weather. It is of little value as hay and is not worth introducing where the ordinary forage plants can be grown. The seed is seldom sown, but the plant comes spontaneously each year from self-sown seed." Prof. E. W. Hilgard, of the Experiment Station at Berkeley, California, says respecting this plant:—"Two species of cranesbill (*Erodium cicutarium* and *moschatum*) are even more common here than in Southern Europe, and the first named is esteemed as one of the most important natural pasture plants, being about the only green thing available to stock throughout the dry season, and eagerly cropped by them at all times."

Though not suitable for hay—since when dry it easily breaks into fine bits and dust—it appears, both from the above testimony and our analysis, to have a distinct value as a pasture plant, more especially for high lands and in districts subject to seasons of drought.

COMPARATIVE VALUES OF "HEAVY FEED" AND BUCKWHEAT BRAN.

These feed stuffs were examined at the request of the editor of the Co-operative Farmer, who states that these materials are being largely fed by the farmers and dairymen of New Brunswick, and that there is a widespread desire to learn their comparative feeding values.

As received, the former had much the appearance of fine bran, and under the microscope was found to consist chiefly of ground wheat and oats; the bran, as separated by sifting, being approximately 25 per cent of the whole. The buckwheat bran was somewhat coarsely ground and showed the appearance of a considerable quantity of hull. The sample is rather one of buckwheat middlings than of buckwheat bran.

The analytical data obtained are as follows:—

COMPOSITION OF "HEAVY FEED" AND BUCKWHEAT BRAN.

	Heavy feed.	Buckwheat bran.
Moisture	9·30	9·21
Albuminoids	16·12	18·62
Fat	5·95	6·45
Carbo-hydrates	58·56	57·92
Fibre	6·50	3·51
Ash	3·57	4·29
	100·00	100·00

The most important constituents of a fodder are the albuminoids, commonly known as flesh formers, and the fat. Other things being equal, we can assign relative values to fodders by taking into account the percentages of these nutrients, according to the following plan. We may assume for the purpose of comparison, the relative values of albuminoids, fat and carbo-hydrates (starch, &c.,) to be 2·5 : 2 5 : 1. The method of ascertaining the feeding value is then to add together the amounts of albuminoids and fat and multiply the sum by 2·5. To the result, the percentage of carbo-hydrates is added. This final amount represents the number of called "food units," which indicate the relative food values of the fodders under comparison.

	HEAVY FEED.	BUCKWHEAT BRAN.
Albuminoids	16·12	18·62
Fat	5·95	6·45
	22·07	25·07
	2·5	2·5
	11·035	12·535
	44·14	50·14
	55·175	62·675
Carbo-hydrates	58·56	57·92
Food units	113·73	120·60

In other words, presuming the digestibility of these products to be equal, one ton of the buckwheat middlings is equal in food value to 1 ton 120 pounds of the "heavy feed." To assign comparative money values, if buckwheat middlings were worth $16 per ton, the heavy feed would be worth $14.11 per ton.

It must not be supposed from the foregoing that the exclusive use of buckwheat bran is recommended; a mixed grain diet will always be found not only more palatable to the animals, but as resulting in more profitable returns. This investigation, however, shows that weight for weight the buckwheat product is the more nutritious of the two.

"GROUND FEED" USED FOR CATTLE IN TRANSPORTATION.

The comparative value of two samples of "ground feed" used for cattle on board ship, examined at the request of the Department of Marine and Fisheries, is reported upon as follows:

General Appearance—Both samples consisted largely of crushed or coarsely ground oats and Indian corn (maize). No. 1 contained a large quantity of the thin chaffy membrane of the maize kernel. No. 2 possessed a very considerable proportion of oat chaff—consisting of the palets and glumes of the seed. Judging from a general, as well as a microscopical examination, sample No. 1 would be considered, on the grounds of apparent richness in composition and mechanical condition, the better of the two feeds.

Chemical Composition.—The samples were submitted to the usual analysis of feed stuffs, with the following results:—

ANALYSIS OF GROUND CATTLE FEEDS.

—	No. 1.	No. 2.
Moisture	10·63	9·58
Albuminoids	12·08	9·17
Fat	5·27	4·42
Carbo-hydrates	63·72	62·86
Fibre	5·25	10·65
Ash	3·05	3·32
	100·00	100 00

As already stated, the most valuable constituents of a fodder are the albuminoids (or flesh formers) and the fat; the least valuable, the fibre. Hence, by reason of the greater percentage of the albuminoids, fat and carbo-hydrates in sample No. 1, and the larger amount of fibrous material in sample No. 2, the former must be considered the more nutritious of the two.

In order to make a comparison between these feed stuffs, or in other words to assign the relative values, it may be assumed as in the preceding chapter, that the feeding values of albuminoids, fat and carbo-hydrates are in the following proportion:—2·5: 2·5: 1.

If it then be further assumed that the digestibility of the two samples be equal—an assumption that gives a slight benefit to the poorer and more fibrous of the feeds—the following calculations will show their relative values as foods :—

	No. 1.	No. 2.
Albuminoids	12·08	9·17
Fat	5·27	4·42
	17·35	13·59
	2·5	2·5
	86·75	6·795
	347·0	27·18
	43·375	33·975
Carbo-hydrates	63·72	62·86
Food units	107·09	96·83

This shows that 1 ton of No. 1 is equal in food value to 1 ton 212 pounds of No. 2.

Supposing the value of No. 1 to be $20 per ton of 2,000 pounds, the value of 1 ton of sample No. 2 would be $18.08.

CANADIAN SOILS.

As explained in the letter of transmittal to this report, we here present the results obtained on certain samples sent by farmers for examination during the past year and a paper containing complete data on the virgin soils of the Dominion examined by us during the past nine years.

The following extracts, from reports furnished the farmers forwarding the soils, are here inserted for the purpose of informing our readers respecting the nature of the examination we make of cultivated soils and of the suggestions offered for the economical treatment of such lands :—

BRITISH COLUMBIA.

Soils from Enderby and Bear Valley, B.C., forwarded by the Department of Agriculture, Victoria, B.C.

Sample from the farm of John Bacon, near Enderby. This soil is rather of the nature of a deposit for it is reported by Mr. Palmer, Inspector of Fruit Pests for British Columbia, as issuing from a hillside. It subsequently hardens by simple exposure. From the vigorous growth of the vegetation in the immediate vicinity of the deposit, Mr. Palmer considered that it might be of importance as a fertilizer.

This sample was received in two parts, one representing the moist, fresh material; the other, indicative of its character after exposure. Both were similar in their composition, save for the larger percentage of water in the former.

A quantitative examination of the air-dried portion furnished the following data :—

Insoluble mineral matter	·09
Carbonate of lime	94·08
Moisture, oxide of iron, alumina, &c.	5·83
	100·00

It is, therefore, evident that this is a marl of excellent quality, being practically free from sand, clay and other inert matter. Judging of this sample, both from its mechanical condition and chemical composition, I am of the opinion that it would be an excellent source of lime for use in agriculture.

A brief review of the more important agricultural purposes of marl or rather, of the functions of lime, is given on pages 161-2 of our report for 1894.

Sample of sub-soil from the farm of Godfrey Rogers, Bear Valley, British Columbia. Its overlying surface soil was of a peaty character, from four to five feet in depth, and extending over some 600 acres. On account of its location and appearance, this sample was supposed to be marl, or at least to contain a considerable quantity of lime.

As received, it was somewhat grayish, quite flocculent and loose as to texture, and very light in weight.

The air-dried sample, on treatment with hot dilute hydrochloric acid, did not effervesce, showing the absence of carbonate of lime. The insoluble residue from this digestion amounted to 80·57 per cent. This material may be considered as inert and practically useless from an agricultural standpoint. Further analysis showed that this substance yielded only a trace of lime, even to strong acids. It cannot be used, therefore as a source of lime and cannot, as far as our work goes, be considered as of any value agriculturally.

Muck Soil from Chilliwack. This soil furnished on examination the following data :—

ANALYSIS OF SOIL (AIR-DRIED).

Moisture	10·55
Organic and volatile matter	70·31
Insoluble matter (clay and sand)	11·24
Mineral matter, soluble in acid	7·90
	100·00
Nitrogen	·946

This soil is in reality a muck of excellent quality, though, as received, rather sour, undoubtedly due to want of drainage and lack of lime. It is especially rich in humus and nitrogen.

The small quantity of clay and sand present would, of course, render it unsuitable for certain crops, more especially cereals, but if this could be remedied by a judicious admixture with the sub-soil or a heavy dressing of similar materials, a very good soil should be the result.

The sub-soil proved to contain 75·84 per cent of clay and sand and 1·04 per cent of lime, which shows that it would be valuable for the purpose suggested. Since, however, it is not rich in lime, its addition to the soil could scarcely be regarded as a substitute for this amendment.

The fertilizers to which this soil would respond are potash, lime and phosphoric acid. To furnish these, wood ashes are of special value, since they not only supply potash, but also lime and phosphoric acid in notable amounts. If potash is applied as kainit or as muriate of potash it would be advisable to add lime, either as such or as marl or gypsum. Phosphoric acids mav be furnished as superphosphate or, still better for land of this character, as basic slag.

The soil is rich in nitrogen, so that with the favourable climatic conditions for nitrification largely prevalent in British Columbia it is very doubtful whether the application of nitrogenous fertilizers would be profitable.

ONTARIO.

Soils from Lefaivre, Alfred Township, Prescott Co., forwarded for examination by Hon. Senator Owens.

ANALYSES OF SOILS (AIR DRIED).

	No. 1.	No. 2.	No. 3.	No. 4.
Moisture	5·31	8·35	8·20	2·67
Organic and volatile matter	7·26	51·69	36·47	8·09
Mineral matter, soluble in acid	20·91	14·51	17·02	20·45
Mineral matter, insoluble in acid	86·52	25·45	38·31	68·79
	100·00	100·00	100·00	100·00
Nitrogen	·185	1·47	1·13	·174
Lime	1·32	....	....	·82

No. 1.—A light gray loam, full of root fibres and containing very little sand. The percentage of humus (decomposed vegetable matter) is small. The soil is strong and retentive, but needs organic manures and lime to improve it. Of the former, barn-yard manure and clover suggest themselves as the best. A composted muck would also be found of great value in lightening the soil and adding to its store of humus and nitrogen. The method of enrichment by means of clover or some other of the legumes is usually the most economical to follow. The best time to plough under such a crop is when it is in full bloom. Useful sources of lime are: lime, slaked or unslaked, marl (carbonate of lime), and gypsum (sulphate of lime). On this kind of soil lime or marl would be the best to use. Briefly, the most economical treatment may be outlined as follows: First, thoroughly drain, then dress with lime or marl; say one ton per acre of the former cr twice the quantity of the latter, to which may be added with advantage 10 to 20 bushels of wood ashes. If the seed bed has been well prepared, seed with clover, sowing buckwheat or rye as a nurse crop. The first crop might be cut and fed, the aftermath, when it had attained a good growth, should be turned under.

No. 2.—This is a muck soil containing much of its vegetable matter in an undecomposed condition. Thorough drainage, in order that it may become compact and at the same time rendered sweet, is to be recommended. This should be followed by an admixture, if possible, of the underlying subsoil. Lime, potash and phosphoric acid are the chief essentials in which the soil is lacking. Wood ashes and superphosphate supply these in available forms. When sourness is corrected and tilth improved by such a treatment as is now suggested, soils like this may be made very fertile, though they are not best suited to grain crops. A small dressing of barn-yard manure, to supply immediately available nitrogen, would undoubtedly be beneficial.

No. 3.—A good muck soil. Drainage, as in No. 2 is here to be strongly advised, in order to correct sourness and aid in improving the tilth. Lime alone, or, still better, with a certain quantity of wood ashes or some other form of potash, would undoubtedly prove of value. Oats, buckwheat, potatoes and roots generally are, perhaps, the crops best suited to this soil.

No. 4.—A stiff clay loam, containing very little sand, and in general character similar to No. 1. It, however, has not the same amount of root fibres, nor is it as rich as No. 1 in humus and nitrogen. In lime also it is very low, the amount being less than the lowest limit allowed by agricultural chemists for obtaining good returns. It is of poor tilth and very hard when dry. Like No. 1, it should never be worked when wet. In general treatment, the course suggested for No. 1 soil is here strictly applicable.

NOTE.—In the report of this Division for 1894 will be found on page 159 some remarks on the improvement of muck soils; in the report for 1895 there is a chapter on green manures, from which may be learned the value and chief features of green manuring with the legumes.

Muck Soil from near London, Ontario. In general features, this soil is similar to that from Chilliwack, B.C., previously discussed; the treatment suggested for that soil might, therefore, be followed in this case.

ANALYSIS OF AIR-DRIED SOIL.

Moisture	12·77
Organic and volatile matter	71·64
Insoluble matter (clay and sand)	5·76
Mineral matter, soluble in acid	9·83
	100·00
Nitrogen	·933

The correspondent forwarding this sample asked for information respecting the rates of application of commercial fertilizers. As doubtless there are many desirous of obtaining similar information, the following brief note is appended.

The most economical amounts to use can only be ascertained by direct trial of the soil with the crop that it is desired to feed, but much time and money can be saved by making an intelligent study of general soil characters and the special requirements of the farm crops. The subjoined table gives the limits of application between which it is usual to employ the commercial fertilizers.

	Fertilizer.	Application per Acre.
Nitrogenous	Nitrate of soda	100– 200 Lbs.
	Sulphate of ammonia	75– 200 "
Phosphatic	Superphosphate	200– 400 "
	Bone meal	500 1,000 "
	Thomas or Basic Slag	400– 500 "
Potassic	Wood Ashes	25– 100 Bush.
	Kainit	300– 700 Lbs.
	Muriate of Potash	100– 300 "
	Sulphate of Potash	150– 300 "

NOTE.—Farmers, market gardeners and fruit growers are invited to correspond with this Division if wishful for information respecting fertilizers, their composition and application. The examination, however, of all brands of commercial fertilizers upon the market is made by the Inland Revenue Department, Ottawa.

QUEBEC.

Soils forwarded for Examination by L. Morin, St. Ours. No. 1.—Farm soil under cultivation, of light gray colour, in friable lumps and powder.

No. 2.—Garden soil, somewhat darker than No. 1, but otherwise very similar to it.

ANALYSES OF SOILS (air-dried).

	No. 1.	No. 2.
Moisture	3·96	2·85
Organic and volatile matter	4·23	9·52
Insoluble mineral matter (clay and sand)	74·10	75·15
Mineral matter soluble in acid	17·71	12·48
	100·00	100·00
Nitrogen	·099	·409
Lime	traces only	

Soil No. 1, is very poor, particularly in humus (semi-decomposed vegetable matter) and in nitrogen. To furnish these constituents, barn-yard manure, a compost made with swamp muck or a green crop (preferably clover or some other legume) turned under, are to be recommended.

Lime, in which this soil is deficient, may be applied as such in the form of marl or gypsum.

Wood ashes, supplying potash, lime and certain other constituents of plant food, would undoubtedly give good returns on this soil. Superphosphate is perhaps the best form for this soil in which to furnish phosphoric acid.

Soil No. 2, is much better, as shown by the higher percentages of organic matter and nitrogen. In general characteristics, however, it is similar to No. 1, and the treatment above suggested would apply for this soil equally well.

Lime may be applied every 5th year, or somewhat more frequently, at the rate of 40 bushels per acre. The usual dressing of gypsum is from 200 to 400 pounds per acre.

Wood ashes give good returns in applications of 40 to 80 bushels per acre. Other forms of potash are, kainit and muriate of potash; of the former, 400 pounds and of the latter, 100 pounds constitute the average amounts for an acre.

Superphosphate at the rate of from 200 to 400 pounds per acre will be found useful for the cereals, grass and turnips.

Considerable experience, together with the knowledge of the special requirements of the various farm crops, is necessary before the most economical amounts of these concentrated fertilizers can be applied. The above quantities are to be considered only as suggesting the limits between which in ordinary farm practice most profitable returns will be obtained.

Soil forwarded for examination by J. O. E. Forest, St. Jacques, Montcalm. A sandy soil, analysis showing but a small percentage of clay. In appearance, it is a loam of fair quality.

ANALYSIS OF SOIL (air-dried).

Moisture	2·60
Organic and volatile matter	8·92
Sand and clay	74·26
Mineral matter, soluble in acid	14·22
	100·00
Nitrogen	·323
Lime	Very small quantity.

Our results do not indicate that the soil is exhausted of those elements required by plants, but without doubt its fertility is capable of improvement. Containing, as it does, sand, clay and humus in fair proportions, it may be termed a soil of average quality, but, nevertheless, by judicious culture and the employment of fertilizers, its crop-producing powers may be increased.

The first care should be towards adding to its store of humus, that is, semi-decomposed vegetable matter. This naturally can be done by heavy applications of barn-yard manure. If such a course, however, is impossible, the practice of "green manuring" should be adopted. This is best and most economically effected by growing clovers, either as a crop or with the cereals, and turning under the aftermath. By such means both nitrogen and readily decomposable vegetable matter are furnished, supplying plant food for future crops, and permanently improving the tilth or texture of the soil.

To facilitate the growth of clover and for the purpose of increasing the soil's store of potash and lime, we would advise an application of wood ashes. These supply both potash and lime, elements required by clover in fairly large amounts, and also contain in notable quantities other plant constituents. Gypsum or land plaster is also a fertilizer of much value for clover, but, it should be remembered, does not contain any potash.

In the place of wood ashes, muriate of potash, at the rate of 100 pounds per acre, may be used. Superphosphate for supplying soluble phosporic acid may also be employed at the rate of 200–300 pounds per acre. For wheat and grass a top dressing of 100 pounds of nitrate of soda in the spring, after growth has commenced, will prove of value in encouraging the young plants.

Soil forwarded for examination by Messrs. Gervais & Frère, Lawrenceville. This is a grayish-yellow, sandy loam, very loose in texture and slightly acid. It contained a considerable quantity of undecomposed root fibres.

ANALYSIS OF SOIL (air-dried.)

Moisture	2·57
Organic and volatile matter	7·58
Insoluble mineral matter (clay and sand)	81·45
Mineral matter, soluble in acid	8·40
	100·00
Lime	·27
Nitrogen	·220
Coarse sand	72·0

This soil, underlaid by coarse sand, has according to accounts been cropped for several years without an application of manure. Its store of available plant food must thereby have been greatly diminished—a process undoubtedly assisted by the leachy character of the soil.

To improve the soil, we would advise organic manures, together with an application of lime, in which the soil is deficient. Barn-yard manure will, of course, be valuable, but if this is difficult to obtain we counsel the occasional turning under of a green crop of clover. A compost made with swamp muck will also prove of service for supplying organic matter and nitrogen.

Commercial fertilizers, such as muriate of potash and superphosphate, may be applied to such soils in the autumn, or, if necessary, in spring, being harrowed in after the ploughing and before seeding. Wood ashes will supply potash and lime and a notable quantity of phosphoric acid. Forty bushels per acre applied every fourth or fifth years should prove remunerative. Muriate of potash at the rate of 100 pounds

per acre may be used if wood ashes are not readily obtainable. Potash is required especially for leafy crops.

Superphosphate, for furnishing soluble phosphoric acid, can be used to advantage for cereals, turnips, &c., at from 200 to 400 pounds per acre.

To induce vigorous growth in the early part of the season, 100 pounds of Nitrate of Soda per acre can be used as a top dressing, applied in, say two portions at intervals of 3 or 4 weeks after the appearance of the crop.

THE COMPOSITION OF CERTAIN CANADIAN VIRGIN SOILS.*

Of the many investigations carried on by the Chemical Division of the Dominion Experimental Farms during the past ten years, not the least in scientific interest nor in agricultural value have been those which have had for their object the determination of the amounts of plant food in certain typical and virgin soils of the Dominion. The data are not as yet voluminous, for this work is one that consumes much time, and other and more pressing demands have only permitted an intermittent attention to it; nevertheless we have been able to place on record results which go far towards indicating the character of many soils representative of large untilled, or, at all events, but partially settled districts in Canada.

In all, we have submitted to complete analysis about ninety samples. These comprise surface and sub-soils taken from the Atlantic to the Pacific in the various provinces of the Dominion, and, to the best of our knowledge, from areas which had never been manured or cropped.

It is not my purpose to present in this paper all the data obtained, nor to attempt an interpretation of all the figures, chemical and physical, that have resulted from this work, for such would scarcely be possible. My intention rather is to bring before you the percentage composition of these soils as regards certain of the more important elements of fertility, and to draw such deductions as to relative richness or deficiency in plant food as may seem warranted when comparing the figures with those obtained from the examination of soils in other countries.

The Value of Ordinary Soil Analysis.—The exact value of a chemical analysis towards ascertaining the fertility of a soil is a question that probably will always be open to discussion, and doubtless all present are aware that no problem in agricultural science has excited more interest or been debated with greater warmth. We are obliged to confess that a knowledge of the amounts of nitrogen, potash, phosphoric acid, &c., as estimated by our present methods of determining "total" or maximum amounts of plant food constituents by strong solvents, is not in itself sufficient for making a diagnosis as to the crop-producing power of a soil. Why this is so, will be apparent upon reflection. In the first place, hydrochloric acid of the strength employed in the analysis dissolves from the soil the mineral constituents in much larger amounts than are present in an immediately available condition; and secondly, there are factors other than the amount of plant food present that are equally important in determining a soil's fertility. The physical condition of the soil, including retentivity of moisture, capillarity, permeability, &c., the meteorologic conditions, including raintall, mean temperature, sunshine, &c., must all be carefully considered in conjunction with the analytical figures when endeavouring to interpret the latter with a view of ascertaining the soil's probable crop-producing ability. The case is very similar to that of water analysis, in which it is universally held that all possible information respecting the source and its environment must be in the possession of the chemist before he can intelligibly and correctly give judgment from his figures upon the quality of the water under examination.

* Read before the Chemical Section of the British Association for the Advancement of Science, at Toronto, August, 1897.

It is often urged that our usual method of soil analysis, using hot, strong hydrochloric acid as a solvent, only indicates the amounts of plant food that may become available, not the amounts that are immediately assimilable. This is true, and it is certainly a drawback, but it in nowise makes the results of no value, as some would have us believe. It gives, we may suppose, the maximum amounts of the mineral elements present which under the influence of favourable climatic and mechanical conditions may become useful to crops. It shows decisively deficiencies in any of the plant food constituents, if such exist, and consequently affords valuable information regarding the suitability of the soil for various farm crops, and, further, indicates the direction in which fertilization may be economically and profitably carried on. Soils with large stores of plant food, even if such be partially or largely in a locked-up condition, have repeatedly been shown to have a greater agricultural value than those that furnish to the same solvent less amounts. The probabilities are that, other things being equal, soils of the former class will contain, or, at all events under favourable circumstances, will yield, larger amounts of readily assimilable food than those possessing smaller "totals" or maximums. Soils showing percentages of maximums above the average invariably prove fertile, if climatic influences are favourable. We cannot argue very closely, I admit, but from such an analysis we are able to predict possibilities as to productiveness, provided agencies favourable to the unlocking of soil plant food are present.

Soil Tests for Ascertaining Available Plant Food—Pot or plot experiments are as yet, the only tests that can infallibly indicate a deficiency in available fertilizing constituents. Such methods, however, consume much time, are cumbersome, and from their very nature scarcely suited to wide application. What is needed is a laboratory method or methods, in addition to those we now use, which will furnish data in accordance with the results obtained by actual soil trial crops. This is a question that at present many agricultural chemists are engaged upon, and I venture to hope that ere long the renewed interest in this work will result in satisfactory methods being established, both for available mineral constituents and nitrogen.

Dr. Dyer's Work.—In March, 1894, Dr. Bernard Dyer's work on available plant food in soils appeared. It was the beginning of a new era in soil analysis. Since that date increased attention has been paid to this branch of research, and especially so on this continent. Every year sees new and interesting data, the results of the labours of agricultural chemists of the experimental stations of the United States. Dr. Dyer, it will be remembered, showed, among other valuable results, that the root sap and the exudation of rootlets possessed an acidity approximately equivalent to that of a one per cent solution of citric acid. From this he argued that such a solution would have a solvent action on the mineral constituents of the soil similar and equal to that exerted by growing crops. Further, he showed that results obtained by this method were strictly in line with the deductions made from the data of actual field trials. He therefore proposed that this solvent should be used to determine available potash and phosphoric acid in soils. Workers in the United States, members of the Association of Agricultural Chemists, besides using this solvent during the past few years, have proposed and worked with other solutions, such as ammonium chloride and calcium chloride. None of these, however, have had the support or corrobation of experiments to show that they were similar or comparable in their action upon the soil to the solvent action of root exudations. Consequently they do not as yet appeal to agricultural chemists with the same force as the solvent proposed by Dr. Dyer.

Solvents Employed.—The solvent used by us in the determination of "total" or maximum percentages of the mineral constituents has been hydrochloric acid, sp. gr. 1·115 (corresponding to 22·86 per cent, HCL.), 10 grms, of the air dried soil being digested with 100 c. c. of the acid at the temperature of the water bath for ten hours.

For the estimation of the "available" potash and phosphoric acid, 1 per cent, citric acid solution has been employed, digesting 100 grms. of air-dried soil with 500 c. c. of the solvent for five hours at room temperature.

Standards of Fertility.—It has been remarked that climate and the physical condition of a soil are potent factors in determining fertility. To this might be added the statement that fertility (i.e., crop-producing power) is a relative quality, depending to a large extent on the crop grown. The ability of plants to forage for and appropriate their food varies greatly, so that what might be an adequate supply of food for one might prove an insufficiency for another. Buckwheat and wheat will very well illustrate this variation in foraging and assimilating ability. For these reasons chiefly—for of course there are others—it is impossible to establish rigid standards as regards the minimum amounts of plant food that must be present in order that a soil may be classed as economically productive.

It is not impossible, however, using a large number of analyses of soils, the productive power of which is approximately known, to deduce percentages or limits of plant food, below which, under ordinary circumstances, soils may be considered as deficient or lacking, and above which they may be considered as well supplied or rich in the essential mineral elements. Professor Hilgard, of the California Experiment Station, the highest authority on American soils, considers that less than 0·09 per cent of potash indicates a deficiency in this element, and that the limits of this constituent in good soils range, approximately, from 0·8 to 0·5 per cent in heavy clays, from 0·45 to 0·30 per cent. in medium loams, and from 0·3 to 0·1 per cent in sandy loams. Regarding phosphoric acid, he says that 0·2 per cent, is sufficient when associated with a good supply of lime, though it may in certain soils reach or exceed 0·3 per cent. Respecting lime, Hilgard states 0·1 in sandy loams as the lowest limit for good crops, 0·25 per cent, in clay loams, and 0·3 per cent, in heavy clay loams.

Standards of Fertility in Canadian Virgin Soils.—Our data indicate that good agricultural soils in Canada possess usually between 0·25 per cent, and 0·5 per cent, potash; less than 0·15 per cent, in our experience, points to the necessity, or at all events to the value, of potassic fertilizers, though with good climatic and soil conditions the limit might be reduced to that suggested by Hilgard.

The phosphoric acid in Canadian virgin soils of average fertility lies usually between 0·15 and 0·25 per cent. Some good soils contain from 0·25 to 0·3 per cent, and a few exceed the latter figure. The adequacy, or otherwise, of phosphoric acid in a soil would appear to depend largely on the accompanying amount of lime. Increased crop production has usually followed the application of phosphatic fertilizers to soils containing less than 0·15 per cent, phosphoric acid.

Lime ranks next in importance to potash and phosphoric acid in a consideration of the mineral constituents of plant food. Our experience goes to show, that clay soils containing less than 0·5 per cent will have their productiveness increased by a dressing of lime in one or other of its agricultural forms. Peaty soils, and soils generally that are rich in organic matter, are frequently poor in this element. All such have been found to respond to an application of lime, and more particularly so when given in conjunction with potash and phosphoric acid. For these classes of soils, therefore, I deem it advantageous that they should contain at least 1 per cent of lime.

Richness in nitrogen may be measured to a large degree by the organic or humus content, though the condition or stage of decomposition of this organic matter is an important factor in determining the nitrogen's availability. The larger number of our good soils contain between 0·1 and 0·2 per cent, though many reach 0·5 per cent, and some exceed 1 per cent nitrogen.

In the following brief review of Canadian virgin soils I have not given any detailed data of their physical condition or composition, for the determinations in our laboratory have been confined simply to the separation of the mineral components into (*a*) clay and fine sand, and (*b*) coarse sand, according to the method of Schloesing. The results in this separation, together with remarks on the physical condition or tilth of the soils, have been indicated in general terms in discussing the samples. If it had been possible to have made a more extended physical examination I believe the data would have proved most valuable, for the degree of permeability to water and air, the relative size of the soil particles, compactness, water-holding capacity, etc., are important factors towards establishing a soil's suitability for the various agricultural crops.

BRITISH COLUMBIA.

Beginning on the west or Pacific coast, attention is first directed to the statement of the composition of certain typical British Columbian soils, as set forth in the following table.

TABLE I.

ANALYSES OF SOILS (WATER-FREE)—BRITISH COLUMBIA.

Number.	Locality.	Surface or Sub-soil.	Character of Soil.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.	Loss on Ignition.
1	Victoria, Vanr. Isd..	Surface	Valley soil, black loam.	·23	·19	·594	1·29	15·69
2	" " ..	Depth, 12 to 18 in.....	....	·23	·19	·506	1·12	13·61
3	" " ..	Depth, 18 to 24 in.....	....	·26	·12	·146	1·01	4·63
4	Alberni " ..	Surface	Dark red clay loam....	·32	·08	·127	1·14	10·79
5	" " ..	"	" sandy loam.....	·17	·34	·163	1·00	11·32
6	Cowichan " ..	"	" " b'ch soil	·39	·32	·102	1·37	7·10
7	Ladners, N. Westr..	"	Alluvial gray blk. loam	·52	·28	·610	·50	17·25
8	Squamish " ..	"	Valley soil......	·38	·20	·091	1·68	3·38
9	Pitt Meadows " ..	"√	Alluvial black loam...	·36	·52	1·050	·32	31·14
10	" " ..	Sub-soil	Grayish yel. sandy loam	·45	·13	·995	·33	6·37
11	Agassiz " ..	Surface	First bench	·32	·24	·159	·86	6·87
12	" " ..	"	Second "	·35	·14	·101	·78	4·34
13	" " ..	"	Valley	·39	·18	·154	·96	6·92
14	" " ..	"	"	·35	·26	·155	·97	7·12
15	Chilliwack " ..	"	" soil, alluvial....	·63	·21	·166	·98	7·72
16	" " ..	Sub-soil ...	....	·51	·23	·108	·90	5·90
17	Mission, Yale. ...	Surface	Light gray clay loam..	·45	·28	·124	1·86	3·96
18	" "	Sub-soil	....	·62	·33	·076	1·90	3·35
19	Guisichan "	Surface	Light gray sandy loam.	·32	·30	·077	1·22	2·66
20	" "	"	Dark gray "	·53	·30	·236	1·70	6·18
21	" "	"	" "	·65	·38	·255	1·76	6·59
22	" "	"	" "	·55	·34	·259	1·25	7·13
23	" "	"	Light gray "	·45	·27	·045	1·61	2·02
24	Quesnelle, Cariboo...	"	Dark gray "	·39	·22	·399	17·77	12·01
25	" " ...	Sub-soil	....	·53	·19	·108	3·80	4·60
26	Cottonwood River...	Surface	Yellowish sandy loam.	·32	·34	·234	1·14	8·28
27	" " ...	Sub-soil	Very sandy...........	·16	·29	·057	·99	3·03
28	" House ..	Surface	D. gray sandy loam....	·57	·24	·412	1·07	13·04
29	" " ..	Sub-soil	Yellowish gray... ..	·47	·10	·050	1·22	3·02

These include three well marked groups :

1. Deltaic Soils.—These have been formed by the accumulation of detritus, as at the mouths of the Fraser, Pitt, and other rivers ; very rich in plant food.

2. Valley Soils.—Largely alluvial as regards origin ; rich, as a rule, in both mineral constituents and organic matter.

3. Bench and Plateau Soils.—At varying altitudes on the sides and summits of elevations and mountains ; variable, but usually light and sandy ; of medium fertility, though sometimes very poor.

Possibly there may be other classes of soils in the province, but our investigation has as yet only included those now referred to.

Soil No. 1.—Taken from a valley near Victoria, Island of Vancouver, and representative of a large area that is considered good farming land. When air-dried, it is a dark brown, almost black loam, of excellent texture, homogeneous throughout, and containing clay and humus in good proportions.

In nitrogen and organic matter this soil ranks very high, and, though not as rich in total potash and phosphoric acid as many of our virgin soils, it is by no means deficient in these important constituents.

Soils Nos. 2 and 3.—Represent the soil immediately beneath the preceding sample at the depth of 12 to 18 inches and 18 to 24 inches respectively. In physical appearance and condition, as well as in composition, No. 2 is very similar to sample No. 1; showing that the surface soil has practically a depth of 18 inches. While, as might be expected, the lower sample (No. 3) is considerably poorer in organic matter and nitrogen, the percentages of potash and phosphoric acid are identical with those in the overlying soil. It is of a yellowish-gray colour with streaks of black soil throughout its mass. It will be seen to be of excellent quality for a sub-soil.

It will be interesting now to consider the proportions or percentages of these elements that may be looked upon as more or less immediately available for plant use, *i. e.*, the amounts extracted by the 1 per cent citric acid solution before referred to.

TABLE II.

Comparison of "Available" with "Total" Amounts of Potash and Phosphoric Acid.

No.	Soil.	Potash.			Phosphoric Acid.		
		Total Potash.	Available Potash.	Percentage of total potash available for plant use.	Total Phosphoric Acid.	Available Phosphoric Acid.	Total percentage of phosphoric acid available for plant use.
1	Surface	0·23	0·00483	2·20	0·19	0.01020	5·66
2	Between 12 and 18 ins..	0·23	0 00299	1 36	0·19	0·01055	5·85
3	Between 18 and 24 ins..	0·26	0·00169	0·64	0·12	0·00588	4·90

In speaking of minimum limits of available plant food, Dr. Dyer says:—"From a careful consideration of the whole of the results, it would perhaps not be unreasonable to suggest that, when a soil is found to contain as little as about 0·01 per cent of phosphoric acid soluble in a 1 per cent solution of citric acid, it would be justifiable to assume that it stands in immediate need of phosphatic manure."

In potash he obtained results that led him to consider that an application of special potash fertilizers would prove valuable when the soluble potash fell below 005 per cent.

In available mineral plant food the surface soil now under consideration is seen to give results approximating these limits. The estimations above tabulated are, however, more particularly useful in showing that the upper or surface portions of the soil contain much larger amounts of available food than the underlying soil. We are thus furnished with data to support the view that the greater productiveness of a surface soil, compared with its sub-soil, apart from the presence of nitrogen, is due in large part to the availability rather than to the total amounts of mineral fertilizing constituents present.

Soil No. 4.—From Alberni, Island of Vancouver; a clay loam of a deep red colour which masks entirely the presence of the large amount of organic matter present. This sample is said to represent the soil to a depth of 9 inches over an approximate area of 10,000 acres. The sub-soil of this area is variable, sometimes clay, sometimes gravel and sand. In potash this soil is comparatively rich; in phosphoric acid, however, it is much below the average. As regards nitrogen it is of medium quality.

Soil No. 5.—Also from the district of Alberni, but differing from No. 4 in certain important features. It is known locally as "fern and sallal" soil, for the reason that on this virgin soil these plants grow most luxuriantly, crowding out to a great extent other vegetation. Our correspondent writes that at first this soil gives but poor returns, but after several ploughings, i.e., several seasons working, the yield increases, and good crops are obtained. An examination of the soil showed it to be distinctly acid to litmus paper. There is in this, no doubt, an indication of the cause of the unproductiveness of the land when first broken up. The effect of exposure to the air through culture would be to correct this sourness, while at the same time locked-up plant food would be set free. Lime and wood ashes have given excellent returns on this soil.

The very large percentage of oxide of iron in these soils—exceeding, frequently, 20 per cent—is a feature worthy of note. It is probable that in the virgin soil a part of this iron is in the ferrous condition, due to the presence of organic matter and to certain other factors. The oxidizing of this iron through cultural methods would free the soil of compounds injurious to the tender rootlets of agricultural crops. It is further important to point out that this soil, though yielding 1·0 per cent of lime to hydrochloric acid, sp. gr. 1·115, had a distinctly acid reaction, and was much benefited by an application of lime.

Soil No. 6.—A bench soil, deep red, of sandy character, from Cowichan, Island of Vancouver, and very similar in appearance to Nos. 4 and 5. It contains less organic matter and nitrogen than these soils, and while somewhat below the average in this respect, it is not to be regarded as deficient in these essential elements.

A determination of the amounts of available potash and phosphoric acid, ascertained by the citric acid method, afforded the following data :—

Available potash	0·0089
Available phosphoric acid	0·0171

While these amounts do not fall below the limits named by Dr. Dyer, they are, however, such as to suggest that both potash and phosphoric acid would prove beneficial, and give good returns in increased crop yields.

Soil No. 7.—A grayish-black soil of excellent texture, from the valley of the Fraser River near one of its mouths, and resulting from the deposition of silt brought down by this river. An area of over 30 square miles is, it is stated, covered by soil of this origin and character. Both from chemical and physical data, this soil would be judged an extremely fertile one, and practical results confirm this opinion. Of phosphoric acid, potash and nitrogen it possesses quantities considerably above the averages already discussed for fertile soils.

Soil No. 8.—From the Squamish Valley, in the district of New Westminster. The valley is said to have an area of 14,000 acres of arable land. Its sub-soil is clay, though sometimes running into sand. Though containing adequate amounts of mineral food for crop requirements, it is below the average in nitrogen and humus. The ploughing under of green crops—preferably one of the legumes—has been found to improve this soil, both as regards tilth and productive power.

Soil No. 9.—From the Pitt Meadows, New Westminster, an alluvial deposit, composed of the detritus brought down by the Pitt River. It is a black loam, in moderately fine granular condition, and possessing a large amount of vegetable organic matter. On moistening it does not become plastic or sticky, and easily crumbles when dry. The soil granules display a remarkable homogeneity, proving the very intimate incorporation of the vegetable organic matter with the inorganic basis of the soil.

Its mechanical texture seems to be such as would allow freedom for root development, for permeation of air and percolation of water, while at the same time it is sufficiently compact and heavy to prevent easy leaching and to be retentive of moisture.

In potash and phosphoric acid it is seen to be well supplied, comparing most favourably in this respect with soils of great productiveness.

In nitrogen the soil is particularly rich, possessing about 34,000 pounds per acre, estimating the weight of an acre of soil to the depth of 1 foot to be 3,500,000 pounds. The physical condition of this soil being such that nitrification would proceed satisfactorily, the value of this large amount of organic nitrogen becomes obvious.

Soil No. 10.—Is the sub-soil of the above, and is a grayish-yellow sandy loam. From its texture we should expect it to offer a very fair drainage to the surface soil.

Soils Nos. 11, 12, 13 and 14.—Are surface soils from the Experimental Farm at Agassiz. They are all of medium quality; in tilth rather light, and, though possessing a fair amount of clay, sand predominates. Though not presenting any marked differences, that of the first bench approaches closely in composition to that of the valley soil No. 14. The valley soils are, as a rule, distinctly richer than those occurring at higher elevations.

Soils Nos. 15 and 16.—Are from Chilliwack, on the Fraser River. They are valley soils, alluvial in origin. While not so rich as the delta soils of the Fraser and Pitt Rivers already discussed, they are by no means poor, possessing a good supply of potash and fair amounts of phosphoric acid and potash. They probably represent more or less truly the character of those soils of medium fertility found in British Columbia in many of her river valleys.

Soils Nos. 17 and 18.—A surface and sub-soil, respectively, from Mission, on Okanagan Lake, Yale district. Both are excellent as regards potash and phosphoric acid, but of poor tilth, caking on being dried into hard masses. The surface soil is somewhat deficient in organic matter, and might be much improved by drainage, judicious culture, and the turning under of a green crop—technically known as green manuring.

Soils Nos. 19, 20, 21, 22 and 23.—Are surface soils from the ranch of His Excellency the Governor General at Guisachan. They are sandy loams of varying shades of gray, and, with the exception of Nos. 19 and 23, might be termed, as far as composition is concerned, soils of more than average fertility. These latter are, however, somewhat deficient in humus and nitrogen.

Soils Nos. 24 to 29.—Are from plateaux and upper benches on the Fraser in the Cariboo district, a practically as yet unsettled area. Clover and indigenous grasses of good quality, it is stated, grow well upon them, and the probabilities are that much of the area here represented will be found suited for grazing purposes. Surface soils Nos. 24 and 28 are particularly rich, judging from the chemical analysis, and should prove very fertile if climatic conditions are favourable.

NORTH-WEST TERRITORIES AND MANITOBA.

The prairie soils of the North-west Territories and Manitoba are justly noted for their productiveness. They contain, as a rule, large percentages of all the essential constituents, and are characterized by percentages of humus and nitrogen far above the average. The prevailing surface soil, speaking generally, is a black or grayish black loam in which the vegetable matter is well decomposed and thoroughly incorporated with the inorganic compounds of the soil. It varies in depth from a few inches to one, two, or even more feet, and over large areas is underlaid with a heavy clay sub-soil.

Occasionally we have had sent to us soils from certain districts in the North-west Territories, in which it is stated that poor yields are obtained. On examination, these soils have been found to possess plant food in adequate quantities for crop requirements. Further, they have usually been found to be free from alkali. Investigation has shown that the trouble was, not in the lack of plant food, but rather in the meteorologic conditions; a scanty rainfall being really the cause of the poverty of growth. In districts subject to drought irrigation, if feasible, would render such soils most fertile. An illustration of this is afforded by the late irrigation trials at Calgary, which have proved so successful from an agricultural point of view. In this connection we have to add that unfortuna-

tely no means for extensive irrigation appear practicable for several of the districts here referred to in the North-west Territories.

The presence of "alkali" in the soil in patches over certain areas in Manitoba and the North-west Territories is intimately connected with the question of rainfall. An alkali area may be restricted to a few square feet, or it may cover some acres. Patches of alkali soil occur surrounded by land of great productiveness.

The formation and retention of alkali are dependent upon the amount of water the soil receives and the facility for sub-soil drainage. We need not now discuss the occurrence of alkali nor its nature, but it is important to note that, though the amounts of alkali found in samples submitted to us are often so great as to render the growth of wheat impossible, we have invariably found such soils to be rich in mineral and organic constituents. This shows that the soil proper is capable of acting as a fertile one, provided the alkali were got rid of by drainage, irrigation, or treatment with gypsum.

TABLE III.

ANALYSIS OF SOILS (WATER-FREE)—NORTH-WEST TERRITORIES AND MANITOBA.

No.	Locality.	Surface or Sub-soil.	Character of Soil.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.	Loss on Ignition.
30	Yorkton, N.W.T....	Surface...	Black, sandy loam.	·49	·21	·501	·06	14·01
31	" "	Sub-soil	.....	·42	·09	·130	·75	8·18
32	Saltcoats "	Surface.....	Black, sandy loam.	·34	·21	·571	2·90	13·54
33	Moosomin "	"	Black loam........	·36	·11	·479	·95	11·79
34	Calgary "	"	....	·44	·17	·447	·92	12·23
35	Tilley Tp. "	"	....	·27	·18	·398	·37	11·13
36	Vermillion Hills,....	"	....	·17	·17	·354	·50	10·43
37	Red Riv. Valley, Man	"	....	1·03	·29	1·005	1·89	26·29

In the foregoing table we have given analytical data of seven surface soils from the North-west Territories. Though there is a greater uniformity in the texture and composition of soils upon the prairies than among soils of the eastern provinces, no claim is made that the vast extent of the territories is represented by these samples—they are altogether too few in number. They may serve, however, to indicate the general character of the soils over certain large areas.

Without discussing these soils in detail, attention may be called to their high nitrogen content and the large amounts of organic matter that are almost invariably present. These soils also contain, as a rule, more than the average amount of potash. Our results do not show them to be noted for phosphoric acid, though they possess quantities quite equal to those in many very fertile soils. It seems more than probale to the writer that the successive cropping of the land with wheat, which has been so common a practice in Manitoba and the Territories for some years, must lead in the near future to the necessity of replacing more particularly of available phosphoric acid.

The great depth of the surface soil over large areas accentuates our deductions respecting the vast stores of plant food laid up in the plains for future crops. We are of the belief that where poor crops only are procurable the climatic conditions are rather at fault than that there is a lack of plant food. Even in soils containing injurious amounts of alkali we have found, as already pointed out, an abundance of fertilizing constituents; drainage, if there is an adequate rainfall, frequently being all that is necessary to bring them into a state of productiveness.

Soil No. 37.—Represents the unfertilized and uncropped prairie soil of the Red River Valley, Manitoba. It was taken from section 31, township 4, range 1, west. The uniformity in the character of the soil over a very large area in Manitoba makes the data here presented of more than ordinary importance.

The surface soil, which is fairly uniform throughout its depth, averages a little over two feet in thickness and merges gradually into the subsoil, which is blue clay. The latter, as tested by boring for water at this spot, extends at least to a depth of 250 feet.

The soil is a deep black loam, of a fine and peculiarly characteristic granular order. It reduces easily between the fingers in the air-dried condition to a grayish brown powder. Though there is present a considerable amount of undecomposed root-fibre, the soil proper exhibits a remarkable homogeneity, indicating a process of physical refining in its formation and a uniformity in the chemical composition. The very large amount of organic matter present is undoubtedly most intimately incorporated with the clay and sand which constitutes the basis of the soil.

Though containing a large amount of clay, laboratory experiments show that this soil does not readily "puddle" on moistening, nor on subsequent drying does it form into a hard mass, but readily granulates on slight pressure. The large amount of organic matter present has already been remarked; it exceeds 25 per cent of the water-free soil. The nitrogen is found to be practically 1 per cent, which would show that there is contained in an acre of soil to the depth of 1 foot more than 30,000 pounds of this element. Since ordinary fertile soils to a like depth contain from 3,500 to 10,000 pounds of nitrogen per acre, the vast reserve of this valuable constituent in this prairie soil is apparent.

The soil is also very rich in potash, containing an amount far in excess of that ordinarily met with in fertile soils. But two other virgin soils examined by us approach its potash content, 1·03 per cent.

Of phosphoric acid it contains 0·29 per cent. This is somewhat above the average, most of our good soils showing between 0·15 per cent and 0·25 per cent phosphoric acid.

We may safely conclude that there is here ample scientific proof of the well-nigh inexhaustible stores of plant food, and that this prairie land, as regards the elements of fertility, ranks with the richest of known soils.

Concerning the prairie soil of the Red River Valley, Dr. Geo. M. Dawson, Director of the Geological Survey of Canada, wrote some years ago as follows:—

"Of the alluvial prairie of the Red River much has already been said, and the uniform fertility of its soil cannot be exaggerated. The surface, for a depth of two or four feet, is a dark mould, composed of the same material as the subsoil, but mingled with much vegetable matter. Its dark colour is no doubt due in part to the general accumulation of the charred grasses left by the prairie fires. The soil may be said to be ready for the plough, and in turning the tough thick prairie sod, the first year a crop of potatoes may be put in, though it is not efficiently broken up till it has been subjected to a winter's frost. When the sod has rotted, the soil appears as a light friable mould, easily worked and most favourable for agriculture. The marly alluvium underlying the vegeable mould would, in most countries, be considered a soil of the best quality, and the fertility of the ground may, therefore, be considered as practically inexhaustible.

"The area of this lowest prairie has been approximately stated as 6,900 square miles but the whole is not at present suitable for agriculture. Small swamps are scattered pretty uniformly over its surface. The greater part of these swamps are, however, so situated as to be easily drained, either into the Red River or some of its tributaries, which are usually depressed 30 or 40 feet below the level of the surface.

"As a measure of the possible agricultural capacity of this great valley, take one-half of the entire area, or 3,400 square miles, equalling 2,176,000 acres, and for simplicity of calculation, let it be supposed to be sown entirely in wheat, then at the rate of 17 bushels per acre, which according to Prof. Thomas, is the average yield for Minnesota, the crop of the Red River valley would amount to 40,992,000 bushels."

ONTARIO.

The review of soils in this province will be restricted to certain surface and subsoil samples collected in the district of Muskoka a district lying somewhat more than 100 miles to the north of Toronto, and considered for the most part, more picturesque than agricultural; it is rocky and abounding in lakes, well timbered, save where destructive

fires have swept through—with stretches of fairly good, though as a rule, light soils along the river valleys and on the lower levels. Our data respecting virgin soils in other parts of the province of Ontario are too fragmentary to warrant their insertion in this paper.

TABLE IV.

ANALYSES OF SOILS, (WATER-FREE)—ONTARIO.

No.	Locality.	Surface or Subsoil.	Character of Soil.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.	Loss on Ignition.
38	Sinclair Tp. Muskoka	Surface.....	Sandy loam......	·11	·27	·186	·12	8·74
39	Chaffey Tp. "	"	"	·08	·12	·139	·40	6·79
40	" "	Subsoil.....	Sand..............	·08	·18	·074	·20	3·53
41	Franklin Tp. "	Surface.....	L. grey loam......	·61	·18	·103	·76	6·31
42	" "	Subsoil.	....	·02	·08	Trace.	·66	3·70
43	Perry Tp. "	Surface.....	Sandy loam.......	·04	·18	·296	·08	9·40
44	" "	Subsoil.	....	·06	·18	·119	·13	5·10
45	Brunel Tp. "	Surface.....	Clay loam........	·46	·17	·084	1·28	2·94
46	" "	Subsoil.	....	·29	·09	·064	1·07	2·39

Soil No. 38.—From Sinclair township. A shallow, very loose, sandy soil ; the subsoil of hard-pan is found at a depth of from 6 to 12 inches. Though moderately rich in phosphoric acid, nitrogen and humus, it is below the average in potash and lime.

Soils Nos. 39 and 40.—Surface and subsoil from township of Chaffey. A shallow sandy loam, running into a subsoil of sand. Hard-pan exists at a depth of 15 inches. The surface soil is deficient in potash, but is otherwise of medium quality as regards plant food.

Soils Nos. 41 and 42.—From Franklin township. The surface soil is a light gray clay loam, high in potash, fair in phosphoric acid and low in nitrogen ; lime is present in an amount that might be considered large for Muskoka soils.

Soils Nos. 43 and 44.—Perry township, Parry Sound district. Soil and subsoil. The country is described as level or gently sloping, with no rocky bluffs, as well as timbered with excellent hardwood.

Both samples are light and sandy in character, and exceedingly low in potash and lime. Regarding the surface soil, we may say that the percentage of phosphoric acid is fair, and that in nitrogen it is above the average soils of this district.

Soils Nos. 45 and 46.—Surface and subsoil from Brunel township. The surface soil is a clay loam of a light gray colour, from 8 to 12 inches in depth. It is a fairly strong and retentive soil, and in this respect differs from the preceding members in this series. The features in its favour are the comparatively high percentages of potash and lime. In nitrogen and humus, however, the soil is poor.

It is thus seen that the soils of this northern part of Ontario are characterized by a preponderance of sand, the larger number being such as would be classed as light or very light loams. It is further of importance to note that in lime these soils are, generally speaking, poor. They are loose in texture and very apt to dry out in season of drought. Though not heavy enough to make good wheat soils, they grow good crops of oats and potatoes. Being responsive to manures, large yields of root and fodder crops can, under good system of culture, readily be obtained in favourable seasons. The district is better adapted for grazing and dairying than for the growth of cereals.

QUEBEC.

The following table presents the data obtained from the examination of ten soils from the province of Quebec. They, as the preceding samples, have been selected as typical average soils; not on the one hand, representing the richest; nor, on the other, the poorest lands.

TABLE V.

ANALYSES OF SOILS (WATER-FREE)—QUEBEC.

Number.	Locality.	Surface or Subsoil.	Character of Soil.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.	Loss on Ignition.
47	Arthabaska County	Surface	Sandy loam	·16	·17	·296	·35	8·68
48	"	Subsoil		·17	·18	·184	·29	5·46
49	St. Adelaide de Pabos, Gaspé	Surface	Red sandy loam	·44	·07	·215	·16	7·85
50	Soulanges County	"	Gray sandy loam	·39	·33	·198	·47	7·76
51	" "	Subsoil		·47	·30	·049	·73	3·67
52	Lièvre River, Ottawa Co.	Surface	Clay loam	11	·19	·179	1·23	5·77
53	" "	Subsoil		·10	·19	·171	1·17	5·62
54	Joliette County	Surface	Black clay loam	·40	·28	·218	·82	8·06
55	" "	Subsoil		·44	·29	·030	1·05	2·09
56	Bonaventure "	Surface	Reddish yel. clay l'm	1·17	·19	.249	·10	12·37

Soil No. 47.—Surface soil from Arthabaska county. A sandy loam of fair quality; nitrogen and organic matter are present in quantities somewhat above the average, but the soil ranks rather low as regards mineral constituents.

Soil No. 48.—Subsoil to the above, and very similar in its proportion of potash and phosphoric acid. For a subsoil it may be considered high in nitrogen.

Soil No. 49.—A surface soil from Gaspé. It is a red sandy loam, containing fair quantities of potash and nitrogen, but low in phosphoric acid and lime.

Soil No. 50.—A dark gray sandy loam from Soulanges county. A light, warm, responsive soil. In all the elements of plant food it may be placed with soils of average fertility.

Soil No. 51.—Subsoil to the above, in which the mineral elements are present in fair amounts.

Soil No. 52.—A heavy clay loam from the valley of the Lièvre River, Ottawa county. A strong retentive soil. With drainage it should be well adapted to the growth of cereals. Though low in potash for a clay soil, it may be regarded as of average fertility. Drainage, the application of lime and the turning under of a green crop have vastly improved its productiveness.

Soil No. 53.—Subsoil to the above, and very similar to it, both chemically and physically.

Soil No. 54.—A clay loam from Joliette county; grayish black in colour, compact and cohesive. Both in mineral constituents and nitrogen this soil is above the average. An application of 20 bushels of lime per acre, however, resulted in almost doubling the yield.

Soil No. 55.—Subsoil to No. 54. Stiff clay, gray to reddish brown.

Soil No. 56.—A surface soil from the county of Bonaventure. A reddish yellow loam, containing a slight preponderance of sand. The large amount of iron present masks the presence of the organic matter, of which there is a notably high percentage. Not unfrequently, indeed, one may say usually, a rough estimate of the organic matter, and, incidentally, of the nitrogen, present, can be made from the colour of the air-dried soil. In soils, however, such as the one under discussion, containing high percentages of iron, the colour can no longer be used as a criterion of the soil's richness in these constituents.

Much variation, as might be expected, in character and composition is to be observed among these soils. Though several possess but small amounts of certain constituents, indicating inadequate quantities for the best returns, yet none fall below the limits of fertility previously discussed, and many are seen to compare most favourably with soils of recognized productiveness.

THE MARITIME PROVINCES.

The soils from New Brunswick and Nova Scotia examined by us have been so few in number that it would be unwise to draw from the data conclusions as to the general character of the soils of these provinces. A few examples are here given which, though representative of large areas, must not be considered as the only provincial types; the figures are inserted here to render the data somewhat more complete than they otherwise would be.

TABLE VI.

ANALYSES OF SOILS (WATER FREE)—MARITIME PROVINCES.

No.	Locality.	Surface or Subsoil.	Character of Soil.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.	Loss on Ignition.
57	Sackville Marsh, N.B	Surface...	Clay loam	·16	·16	·131	·13	5·83
58	Restigouche, N.B....	" ...	Yellow sandy soil...	1·02	·10	·113	·23	5·46
59	Cumberland, N.S....	" ...	Sandy loam.........	·16	·09	·090	·06	3·37
60	S. W. Mabou, N.S...	" ...	"	·37	·09	·212	·05	6·97
61	Kings Co., P.E.I....	" ...	"	·47	·09	·106	·08	5·10

NEW BRUNSWICK.

Soil No. 57.—From the Sackville Marsh, at the head of the Bay of Fundy. A clay loam; of interest as an example of a soil area very uniform in character—a fact no doubt due to the origin of the soil, which is practically a tidal deposit. When thoroughly drained, an operation which frees them from salt and improves their texture, these reclaimed marsh soils are found to be exceedingly fertile. A glance at the analytical data shows that this is not altogether to be ascribed to large percentages of plant food; it is more than probable that the fine state of division and the intimate incorporation of the soil particles—due to the manner of the soil's formation and deposit—render the elements of fertility more easily obtained and assimilated by the plant.

Soil No. 58.—Balmoral settlement, Restigouche. A yellow loam, derived principally from the decomposition of felspar, through showing some quartz fragments. The percentage of potash is considerably above that found in average fertile soils—a fact undoubtedly due to the felspathic origin of the soil. With the exception of potash, however, the soil cannot be considered one equal to Canadian soils of average fertility.

NOVA SCOTIA.

Soil No. 59.—A reddish, sandy soil, from Hansford, Cumberland county. It is below the average in the more important elements, and to be regarded as a poor soil. It would probably, however, respond well to judicious culture and manuring.

Soil No. 60.—A soil from South-west Mabou, Inverness county; very similar in appearance to No. 59, but analysis shows it to be much richer. The small percentage of lime is particularly noticeable in both these soils; the knowledge of this fact has assisted towards the economical treatment of them with fertilizers.

PRINCE EDWARD ISLAND.

Soil No. 61.—This soil partakes of the same colour as the light red Triassic sandstone from which it has been derived, and in this respect at least this sample is representative of the characteristic soil of the province. It differs from the preceding specimens in that it is not a truly virgin soil. Some difficulty was experienced in procuring a sample which had not been cropped or manured; indeed, no guarantee of such could be obtained. The soil, however, is said to fairly represent the unmanured but cultivated soil that extends over a large area in the eastern portion of the island. It is a light sandy loam, the texture of which is fairly good. Though containing more than the average amount of potash, this soil could not be ranked, from a chemical standpoint, with our richer Canadian soils—possessing but small percentages of nitrogen, phosphoric acid and lime.

This agricultural province is justly known as a fertile one; and we therefore presume, judging from such data as we have, that this fertility is due rather to good soil texture and favourable climatic influences than to richness of its land in plant food constituents.

The last table (Table VII) that is presented for consideration, showing the average amounts of fertilizing ingredients in the surface soils that have been examined, taken province by province, has been prepared with no little diffidence. If it were to be interpreted as placing before you data from which deductions could be made as to the average soil fertility of the yet untilled areas of the respective provinces, it must be regarded as misleading. It is not my intention that such a conclusion should be drawn. A hundred or so samples, though they are typical, and, as far as possible, thoroughly representative of large areas, taken from the thousands of square miles of uncultivated soil in the Dominion, do not afford sufficient basis for such generalizations. They are not provincial averages, they are rather averages from large untilled areas in the several provinces, and may therefore serve to indicate the general character of much of the yet unoccupied lands of Canada.

TABLE VII.

ANALYSES OF SURFACE SOILS—AVERAGES.

No. of Samples.	Province.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.
21	British Columbia	·42	·27	·262	1·17
7	North-west Territories and Manitoba	·44	·19	·537	1·08
6	Ontario (Muskoka only)	·22	·15	·135	·44
6	Quebec	·44	·20	·226	·52
5	Maritime provinces	·44	·11	·130	·11
45	Average of all	·39	·18	·258	·66

When we remember that care and judgment were exercised in the selection and collection of these samples, that the analyses were carefully conducted according to modern and approved methods, that very few of the samples fall below the standards or limits fixed by agricultural chemists, and that many contained such ample stores of plant food as to warrant them in being classed among the most fertile soils, we may, I think, safely conclude that the data here set forth clearly indicate that while there are many types of soils represented in Canada, there are in all her provinces large tracts of land that, as far as plant food is concerned, compare favourably with the most productive of other countries.

Canada is fast becoming known in the markets of the world as a food-producing country. Soil rich in plant food and favourable climatic influences are the chief factors that have assisted the Canadian agriculturist in building up this reputation. These are the factors, together with intelligent, rational methods of farming, and safe and cheap means of transportation, that will continue to make agriculture here a prosperous industry. It is therefore gratifying to know that ample scientific proof is now on record to show that in our virgin soils there is such an abundance of those crude materials which crops draw upon directly, and farm animals indirectly, for their sustenance and growth.

NATURALLY-OCCURRING FERTILIZERS.

SWAMP MUCK.

We have so fully discussed in previous reports the agricultural uses of this naturally-occurring fertilizer that it will only be necessary on the present occasion to record the analytical data obtained on the samples examined during the past year, and briefly indicate their quality.

ANALYSES of Swamp Muck (air dried) 1897.

No.	Locality.	Sender.	Nitrogen.		Organic and volatile matter.	Sand and clay.	Mineral matter, soluble in acid.	Water.
			Per cent.	Pounds in one ton of air-dried muck.				
1	Chilliwack, B. C	G. M. Stuart......	·946	18·9	70·31	11·24	7.90	10·55
2	Alberni, Vancouver I'd, B.C.	Albert E. Reeve...	2·470	49·4	71·77	·43	10·21	17·59
3	" "	" ...	1·027	20·5	32·24	36·15	21·25	10·36
4	Loch Garry, Ont...........	J. Fraser..........	1·767	35·3	67·04	13·18	9·07	10·71
5	Near London, Ont....... ..	G. P. Collyer......	·933	18·6	71·64	5·76	9·83	12·77
6	St. Williams, Ont.	Andrew McCall...	1·010	2·0	31·93	55·90	6·65	5·52
7	Aitken's Ferry, P.E.I.......	D. J. Stewart.....	2·54	50·8	67·89	9·91	10·36	11·84
8	" "	"	1·45	29·0	43·30	40·50	9·78	6·42
9	Egmont Bay, P.E.I..... ...	E. Arsenault......	1·515	30·30	71·43	12·61	12·61	15·96

No. 1. A sample representative of an area of considerable size near Chilliwack, covered with peat or muck. It is of excellent quality, but at present rather sour, due to lack of lime and want of drainage. Owing to the small quantities of clay and sand

present this soil is unsuitable for certain crops, but if this could be remedied by a judicious admixture with the subsoil or surface dressings, a very good soil would result.

With good drainage and the addition of mineral fertilizers, nitrification would proceed satisfactorily and there would be no necessity to apply nitrogenous fertilizers. Wood ashes would be of especial value, as supplying potash and notable quantities of lime and phosphoric acid. If potash is applied as kainit or muriate of potash, it will be necessary to add lime, as such or as marl or gypsum, and to furnish phosphoric acid as superphosphate or, better still for such soils, as basic slag.

No. 2. From an area of 2,500 acres covered by swamp muck in section 7, township Alberni. The depth of muck in the centre of the swamp, it is stated, exceeds ten feet; at the edges, the subsoil of clay outcrops. It is practically all vegetable matter.

No. 3. From a swamp in section 8, Alberni township. "In times of high water it is frequently covered."

As regards nitrogen, No. 2 is much the better of the two, but both may be classed as excellent. They are, however, distinctly sour, pointing to the necessity of drainage and the application of an alkaline mineral fertilizer, such as wood ashes, lime, &c., before they could be used profitably as soils.

No. 4. Contains too much undecayed wood to be of any immediate value, but perhaps could be used, after being air-dried, to advantage as an absorbent for liquid manure and in the manure pile. It contains a considerable amount of nitrogen.

No. 5. As a muck to be used as a fertilizer, it may be considered of good quality, but as a soil it would need the admixture of clay and sand and the application of mineral fertilizers.

No. 6. This sample, owing to its large amount of clay and sand and comparatively small proportion of nitrogen, could not be recommended for absorbent purposes; nor would it pay to compost it, unless it could be handled very cheaply.

Nos. 7 and 8. These samples are from the surface and bottom of a swamp, respectively. No. 7 is loose and consists, for the greater part, of root fibres. It could be used as a coarse bedding and for composting. No. 8 is, when freshly dug, of a sticky nature, but dries to a hard, brittle mass. It would require to be subjected to the disintegration action of the winter's frost before becoming of any value.

No. 9. This sample is from a Cedar swamp. It contains a considerable quantity of undecomposed woody fibre. It requires weathering and composting with wood ashes or lime. It would probably make a fair absorbent in the barn-yard.

MARSH, CREEK AND TIDAL DEPOSITS.

These are generally known in the maritime provinces as "muds." Brief reports of those samples examined in the farm laboratories during the past year are given, but it has not been thought necessary to consider in detail their origin, composition, and their effect on soils, since such a consideration has already appeared in the reports of this Division.

The most important of the samples analysed are from large unreclaimed marshes in New Brunswick and Nova Scotia. Time has not permitted complete analyses of these, though such would have been desirable. A further question to be taken up in connection with marsh muds is the determination of the *relative availability* of their elements of plant food. We hope to be able to undertake this investigation during the coming year.

Other samples, the details of which are now given, were forwarded from the provinces of British Columbia, Quebec and Prince Edward Island.

Nos. 1 and 2. "Mud" or soil from a large, unreclaimed marsh near Nappan, N.S., sent by Wm. Blair.

ANALYSIS OF AIR-DRIED "MUD," NAPPAN, N.S.

——	*No. 1.	†No. 2.
Water	2·16	3·78
Loss on ignition, chiefly organic matter	4·12	5·86
Mineral matter, insoluble in acid	79·24	75·33
Mineral matter, soluble in acid	14·48	13·04
	100·00	100·00
Nitrogen	·137	·136
Coarse sand	37·95	16·60
Clay and fine sand	41·29	58·73

* No. 1, 4 feet below surface. † No. 2, 1 foot below surface.

When received, the samples were in a plastic, pasty, compact condition of a grayish colour and were slightly acid to litmus paper. On drying a portion at 212 degrees Fah., is was found that No. 1 contained 30·5 per cent of water, No. 2 contained 36·0 per cent of water. Root fibres were to be noticed in both samples, but curiously enough were in greater abundance in sample No. 1.

On allowing to dry spontaneously in the air, both soils became hard and somewhat difficult to break with the fingers.

Save in the relative proportion of sand and clay, there would not appear to be any marked differences in these two samples, and it may be fairly assumed that there is a great degree of uniformity in the character of the soil—at all events to the depth of four feet.

The analytical data, as far as they are complete, would go to show a strong similarity in composition between these samples and other specimens of marsh mud from the Bay of Fundy that we have previously examined in our laboratories. The percentages of organic matter and nitrogen now found are somewhat below the averages obtained from the samples just referred to, but nevertheless, they are quite equal to those found in many fertile soils. A comparison of the figures will make apparent a fact worthy of note, viz. : that the amount of nitrogen is the same in both samples. This would lead us to conclude that the percentage of this element remains constant to a depth of at least four feet. As nitrogen is one of the essential elements of fertility, and at the same time one of the most costly when purchased in commercial fertilizers, this feature is necessarily one of great importance.

The percentage of lime, as judged from a qualitative examination, is not large, probably about ·5 per cent or somewhat under.

Reviewing the facts, we conclude there is no reason to suppose that this soil, if thoroughly drained and properly worked, would fall behind in fertility any of the dyked lands of Nova Scotia and New Brunswick that have originally been formed by tidal deposits.

In conclusion it may be pointed out that drainage is necessary to bring about a better mechanical condition and also to ensure aeration of the soil. Aeration would correct the slight sourness that now exists and convert any soluble iron compounds into insoluble and innocuous forms—a desirable end to be attained in marsh muds. Drainage would also free the soil of the small quantity of common salt it contains.

No. 2. Marsh mud from an unreclaimed marsh at St. Martin's, St. John Co., N.B., forwarded by Mr. Howard Trueman, Pointe de Bute, N. B.

This soil or "mud" is from an area of 400 acres covered with a tidal deposit. At high tide it is overflowed by the waters of the Bay of Fundy. The marsh has never been properly dyked and is not under cultivation.

ANALYSIS OF AIR-DRIED "MUD," ST, MARTINS, N.B.

Moisture	7·66
Organic and volatile matter	7·61
Insoluble mineral matter (clay and sand)	71·96
Mineral matter, soluble in acid	12·77
	100·00
Lime	·42
Nitrogen	·281
Common salt	1·4

There is nothing in the results against the prediction that if properly drained and treated this would make a fertile soil.

Considering that it is not yet drained, its tilth or physical condition may be judged as good. It contains fair amounts of organic matter and nitrogen. The percentage of salt is high, too high for the best results with farm crops, but the excess could be easily removed by drainage, which would at the same time sweeten and aerate the soil.

An application of lime, say 40 to 60 bushels per acre, would, in all probability, greatly increase this soil's productiveness.

No. 3. "MUD" FROM NEAR VANCOUVER, B.C.

The correspondent forwarding the sample writes as follows :—

"The sample was taken from beneath a slaughter-house built on piles close to the salt water where a number of pigs are kept, the urine and dung flow through the flooring, but being covered and laid bare by every tide, I am doubtful as to whether there would be any fertility left."

Our data are as follows :—

ANALYSIS OF AIR-DRIED "MUD," VANCOUVER, B.C.

Moisture	4·25
Organic and volatile matter	17·45
Mineral matter, insoluble in acid	63·33
Mineral matter, soluble in acid	14·97
	100·00
Nitrogen	·548

This material has undoubtedly a fertilizing value, though it cannot be regarded as the equal of barn-yard manure. The percentage of nitrogen is very similar to that in fresh manure, but the greater part of it judging from the appearance of the material is in an unavailable condition.

No. 4. "MUD" FROM BARACHOIS DE MALBAIE, GASPÉ, QUEBEC.

This was obtained from the bed of a brook running into Barachois Bay, being forwarded by Rev. P. F. Sirois. It contained a large quantity of sand and a considerable amount of orgamic matter.

ANALYSIS OF AIR-DRIED "MUD," GASPÉ.

Moisture	1·71
Organic and volatile matter	8·35
Mineral matter, insoluble in acid	80·25
Mineral matter, soluble in acid	9·69
	100·00
Nitrogen	·274

This cannot be considered as a fertilizer of marked value, though on poor soils it might prove useful as an amendment. Both in composition and appearance it is similar to a light, though fairly good soil.

No. 5. "MUD" FROM NEAR SUMMERSIDE, P.E.I.

This sample was taken from the bed of a creek running through the farm of Wm. Lefurgey, and is very similar to the mud, the particulars of which appear on page 193 of our 1896 report. The analytical data may be tabulated as follows:—

ANALYSIS OF AIR-DRIED "MUD."

Moisture	2·37
Organic and volatile matter	9·30
Mineral matter, insoluble in acid	65·70
Mineral matter, soluble in acid	22·63
	100·00
Lime	·92
Nitrogen	·33

This deposit though not profitable for composting with barn-yard manure, is undoubtedly of some value for supplying the elements of plant food. It might be dug in the autumn and piled to dry. The winter frost will tend to disintegrate it, improving its mechanical condition. It might then be composted with lime, which will serve to set free its plant food; or if wished, it may then be applied directly to the land, though used in this way it is not so immediately effective.

MARL.

This material is essentially carbonate of lime. The value of a sample depends upon the percentage of this constituent; marls in which the carbonate of lime is associated with much clay or sand are of inferior quality.

Marl occurs in various parts of the Dominion as an earthy gray or grayish-white deposit; it usually shows the presence of fresh water shells. Marl frequently underlies a bed of peat or muck in a swamp or forms the bed of a dried-up lake.

In districts where it is found, marl is the cheapest of all lime fertilizers. Marl, not being of a caustic nature, is frequently known as "mild" lime. It is owing to this characteristic that an excess of marl does not injure a soil, as frequently occurs from an over application of lime.

The following samples from different parts of Canada have been examined in our laboratories:—

British Columbia.—Sample from Stanley, Cariboo District: Yellowish white, very porous and soft; contains traces only of inert matter (clay and sand) and is practically all carbonate of lime. It may be considered an excellent sample of marl.

Ontario.—This sample, collected near London, consisted of lumps and powder of a grayish-white colour, the lumps powdering under slight pressure. It contained a large number of shells, indicating its origin as a fresh-water lake or pond deposit.

ANALYSIS.

Moisture	·49
Insoluble matter (clay and sand)	·25
Carbonate of lime	95·95
Undetermined mineral matter and traces of organic matter	3·31
	100·00

This is an excellent sample of marl, both as regards composition and texture. It is practically free from inert foreign substances, and could be used with advantage on all soils deficient in lime.

Sample from Lot 34, Con. 4, Edwardsburg. Light-gray, flakey, light, easily crumbled, contains shells. Insoluble matter probably in the neighbourhood of 10 per cent. This may be regarded as a very fair sample of marl.

Quebec.—Sample from Metapedia. Grayish-white, easily crumbled and in excellent mechanical condition; contains some few shells. It is almost entirely soluble in hydrochloric acid, showing absence, or but traces only, of inert matter. A very good sample.

Samples from township of New Richmond. No. 1. From a lake bed. Wet and plastic when received. A small quantity of organic matter; very little sand or clay.

No. 2. Grayish-white, more inert matter than in preceding sample. A number of fine roots and shells present. Of medium quality.

Nova Scotia.—Sample from Antigonish. Of a dull reddish-gray colour. It has the appearance of a semi-decomposed limestone and probably is not of the same immediate benefit to land as shell marl.

THE USES OF MARL.

An application of marl has been found useful to all soils deficient in lime, and especially to such as are rich in humus, assisting greatly in the nitrification of this constituent.

For correcting the acidity of soils, a property injurious to crop growth, marl is very effective. Recent experiments have shown that soil acidity is by no means rare, even in sandy loams situated in upland districts. A dressing of lime or marl to such soils has always resulted in increased crop yields. These materials have also proved useful to old pastures and waste lands where sorrel and bracken have obtained a foothold.

Though a less active agent than lime for liberating potash from its locked up stores and for the amelioration of heavy clays, marl serves in bringing about these ends, and can be used for such with safety, since an excess will not injure the soil.

A further use of marl is in compost heaps containing vegetable and animal refuse, swamp muck and other organic matter. It here promotes nitrification, providing conditions of moisture and temperature are favourable, and thus assists in converting useless nitrogen into valuable plant food.

A chapter stating more fully the various agricultural uses of this naturally-occurring fertilizer is to be found in the report of this division for 1894.

LOBSTER REFUSE FROM THE CANNING FACTORIES.

Several inquiries being received respecting the fertilizing value of this waste product, and there being no data on record as to the composition of this material, it was deemed advisable to make an analysis and thus ascertain its agricultural worth. Through the kindness of Professor E. E. Prince, Dominion Commissioner of Fisheries, two samples of the refuse were obtained from a canning factory near Pictou, N.S. One of these consisted

of the bodies of the lobsters, the other of the tails, claws, shells, &c. Their composition as received may be tabulated as follows:—

ANALYSIS OF LOBSTER REFUSE.

Constituents.	Bodies.	Tails, &c.
Water	69·28	56·37
Organic matter	22·44	24·23
Mineral matter	8·28	19·40
	100·00	100·00
Nitrogen	1·78	1·56
Phosphoric acid	1·01	1·66
Lime	3·25	9·99
Value per ton, estimating nitrogen at 10 cents per pound and phosphoric acid at 5 cents per pound	$4.57	$4.68

The comparatively large percentage of water present in the fresh material would prevent it being used economically at any great distance from the factory, but the figures show that it has an undoubted value as a fertilizer for supplying nitrogen and phosphoric acid. Owing to the large amount of organic matter present, it may well be supposed that this material will decompose readily in the soil, setting free its plant food in available forms. It may be regarded as a quickly acting manure, and one well adapted for the making of rich compost with muck or peat.

Where this material is produced in large quantities and fuel is cheap, in would seem that a fertilizer of considerable value could be profitably made by simply drying and grinding the refuse. For if dried to 10 per cent moisture, one ton would contain the following amounts of nitrogen and phosphoric acid:—

FERTILIZING CONSTITUENTS AND VALUE PER TON OF DRIED LOBSTER REFUSE.

Fertilizing Constituents.	Pounds per ton.	
	Bodies.	Tails, &c.
Nitrogen	104.	64·
Phosphoric acid	56.	69·
Value, estimating nitrogen at 10 cents per pound and phosphoric acid at 5 cents per pound	$13.35	$9.95

Lobster refuse, it appears, is at present a frequent source of danger to the canning industry, being, in certain districts, allowed to decay in the neighbourhood of the factory. The preparation of this material as a fertilizer would not only tend to prevent the spoiling of the canned lobster,—which has occurred of late to such an extent as to threaten the industry with disaster,—but also furnish a profitable means of disposing of a product hitherto considered useless.

LIME KILN ASHES.

Several inquiries from the maritime provinces having been received respecting the amounts of fertilizing constituents in lime kiln ashes, a sample obtained from Cape Breton was submitted to analysis, with the following result :—

ANALYSIS.

Moisture	2·04
Insoluble matter (clay and sand)	9·45
Potash	2·64
Phosphoric acid	2·15

Though not so rich in potash as wood ashes, it is evident that this material has a distinct fertilizing value. The phosphoric acid is approximately equal in amount to that in wood ashes.

It is to be supposed that much variation in the composition of different samples will occur, but there can be no doubt that well preserved ashes from the kiln contain notable quantities of the more important mineral elements of plant food. Leaving out of consideration the lime and other constituents of minor value, the ashes now examined possess per ton, approximately 53 pounds potash and 43 pounds phosphoric acid. The former may be valued at 5c. per pound, the latter at 3½c. per pound. At these prices the value per ton would be in the neighbourhood of $4. It is to be remarked that the sample examined was very dry, a larger percentage of moisture present would necessarily reduce the amounts of the other constituents. The average composition of seventeen samples of lime kiln ashes as ascertained by Dr. Goessman, of the Experiment Station of Massachusetts, U.S.A., is as follows :—

Moisture	14·48	per cent.
Potash	1·28	"
Phosphoric acid	1·09	"
Lime	42·57	"

FERTILIZING CONSTITUENTS IN PURSLANE.

(Portulaca oleracea).

This common pest in gardens is frequently known as "pusley." It delights in rich soil, spreads rapidly and is exceedingly difficult to eradicate owing to its intense vitality. This quality, as laboratory experiments showed, it possesses in a most remarkable degree; cuttings half an inch in length after being exposed for five weeks to the drying atmosphere of the room, sprouted and grew readily on being placed in damp soil.

To ascertain the extent to which this troublesome weed might exhaust the land of its plant food, the following investigation was made. The plants from an area of 4 ft. by 10 ft. were collected by Mr. Craig, the horticulturist, and found to weigh 28 pounds. This would be equivalent to a crop of 15 tons 492 pounds per acre. Mr. Craig adds "the plants are about half grown (2nd August), but they nevertheless cover the ground with a fairly heavy and close 'mat' of vegetation."

On analysis, we found the green, fresh material to have the following composition :—

ANALYSIS OF PURSLANE, CUT 2ND AUGUST, 1896.

Moisture	93·54
Organic matter	4·82
Ash and mineral matter	1·64
	100·00

FERTILIZING CONSTITUENTS IN PURSLANE.

	Per cent.	Pounds per ton.
Nitrogen	·219	4·38
Potash	·661	13·22
Phosphoric acid	·079	1·58

On the assumption that the crop over an acre would weigh 15 tons, by no means an extravagant estimate, we obtain the following weights of the essential elements of fertility withdrawn from that area by this weed :—

	Pounds per acre.
Nitrogen	65
Potash	198
Phosphoric acid	24

It is apparent from these data that purslane extracts from the soil very considerable amounts of soil plant food, especially of potash. Analysis shows that forty per cent of the ash consists of this valuable element.

Besides this robbing of the growing crop, it is evident that this weed uses very large quantities of soil water, thus depriving the legitimate crop of its rightful supply at a critical time in its growth. This moisture-extraction we have come to recognize in recent years as one of the most direct and injurious results from weed growth.

FERTILIZERS FOR MAKING COMPOSTS—A WARNING.

From time to time irresponsible and fraudulent parties endeavour to sell farmers receipts and materials for making composts. These may be useless, or indeed, injurious, but more frequently the fraud consists in misrepresentation and the selling of the "manure makers" at prices far exceeding their agricultural value. On several occasions we have been appealed to for advice and chemical assistance in such matters and usually with the result that a fraud has been discovered and exposed.

In the early part of the present year, letters were received from several correspondents in Prince Edward Island directing our attention and asking for information regarding "Kay's process for making manure" and the nature of the material accompanying the receipt. For the "directions for use" sums were asked varying from $10 to $20—the price fluctuating, apparently, according to the supposed wealth of the purchaser, the cost of the compound—to be employed at the rate of one pound to one load of marsh mud, &c.—being $5 per 100 pounds.

As received, this was a whitish-gray powder, having the appearance of lime. It was strongly caustic and effervesced vigorously on the addition of acid.

The results of our examinations are as follows :—

ANALYSIS OF KAY'S COMPOUND.

Moisture	·84
Loss on ignition	2·06
Sand, clay, oxide of iron, &c	5·20
Lime, as oxide (equivalent to 78·98 per cent slacked lime or 104 per cent carbonate of lime)	58·24
Magnesia	small quantity.
Common salt	4·35
Potash	·58
Phosphoric acid	traces.
Nitrogen	none.

This material is composed practically of lime, in part slacked and carbonated by exposure to the atmosphere, together with a small quantity of salt.

The essential elements of fertility—nitrogen, potash and phosphoric acid—which alone give value to commercial fertilizers, are, with the exception of ·5 per cent potash, ***conspicuous by their absence.***

A mixture of lime and salt has long been used as a material for composting with muck and substances of a like character. The lime is slaked with brine—the proportion used being about 1 part of salt to 20 parts of lime. The "fertilizer" under examination is evidently of this character.

The commercial value of the material is approximately that of lime, plus that of the small amount of salt it contains. Though no statement is made by the vendor as to the plant food it contains, we are of the opinion that asking $5 per cwt. for a mixture of lime and salt practically constitutes a fraud. Agriculturally, it may be considered useful for composting purposes (though it should not be used in conjunction with barnyard manure in the compost heap) and for supplying lime to soils deficient in that element, but for this purpose its value would not exceed $4 to $5 per ton. It may be pointed out that wood ashes would make a much richer compost, since they contain both potash and phosphoric acid.

We may again repeat that this so-called fertilizing compound is in no sense comparable to those commercial fertilizers upon the market that supply the necessary and more costly constituents of plant food, viz., nitrogen, potash and phosphoric acid.

MOSS LITTER.

Attention was drawn to the usefulness of this material for bedding purposes in our report for 1895, Vide, pp. 212-13. It was pointed out that its high absorptive capacity for fluids and gases render it particularly valuable as a litter for use in city stables. Since the appearance of the information there conveyed, several samples from large bogs in New Brunswick and Nova Scotia have been sent for examination, in order to ascertain the absorptive value of the Canadian produced litter as compared with that exported from Holland. The results now recorded have been obtained from samples collected by Mr. W. Saxby Blair, Horticulturist, Experimental Farm, Nappan, N.S., from Big Plain Bog and Weldon Bog, N.S., in both of which the supply is said to be well nigh unlimited. They were both clean and bright specimens, consisting of fine straight fibres and free from all foreign matter. The analytical methods used were the same as those detailed in the aforementioned report.

ANALYSIS OF MOSS LITTER (AIR-DRIED).

Constituents.	Big Plain Bog.	Weldon Bog.
Moisture	15·7	16·20
Organic matter	82·5	81·75
Ash	1·8	2·05
	100·00	100·00
Nitrogen	·527	·596
Absorptive capacity	1395	1533

As regards composition, these samples are very similar, and, it may be remarked do not materially differ from the litter mosses previously reported upon. Their absorptive capacity is very satisfactory; their low "ash" shows absence of earth, and their nitrogen content indicates that the resulting manure would be materially enriched in this valuable constituent of plant food.

A further and most important use for moss litter has recently been found. It has been used with good success as a packing material for fruits and other perishable articles in transit. Its absorbent power keeps the fruit dry and thus assists in arresting or preventing that decomposition which always follows "sweating," due to imperfect ventilation and other causes. From a hygienic, as well as a mechanical standpoint, moss litter should commend itself as a packing medium.

WELL WATERS FROM FARM HOMESTEADS.

It should be realized by all farmers and dairymen that an ample supply of pure water for the use of the household and stock is a matter of the greatest importance. Careful investigations have furnished proof as to the danger to the health of human beings from drinking polluted water, and what must be injurious to man cannot be good for beast. Until quite recently all that was thought sufficient was to provide nourishing, palatable food for farm animals; but little heed has been paid in the past to the quality of the water the animals drank. It is with pleasure, therefore, that we record a deeper interest year by year on the part of our agriculturists in this question, a greater desire to know the character of the water supplied to their stock and a stronger inclination to rectify matters when it has been pointed out to them that the supply was polluted.

Water contaminated with excrementitious matter, we are, or ought to be, fully aware, has been frequently the cause of spreading typhoid fever and other serious and often fatal infectious diseases. In such water all the most favourable conditions are present for the growth and rapid development of disease germs should they find an entrance. As a people, however we have failed to recognize that the continued use of water containing the decomposing dejecta of animals has a peculiarly baneful and, at the same time be it noted, insidious effect on the general health. Undoubtedly many cases of indigestion, diarrhœa, sick headache and many similar illnesses have had their cause in the use of polluted water.

But not only is the health of the farmer and his family endangered by a bad water supply, the health and thrift of his stock must likewise be impaired. Good health and freedom from disease in stock, are dependent to a great extent upon an abundant, pure water supply. Similarly, in the dairy, creamery and cheese factory, pure water is an absolute necessity if the products are to be first class and preserve a good flavour. Several of the samples examined during the past year were sent from cheese factories in which trouble had arisen in the matter of flavour, and in all the instances the water was found to be foul and polluted. This is a significant fact and carries its lesson to those engaged in dairying.

The most common cause of well pollution has been the sinking of the well in the barn-yard or under one of the farm buildings. We object to this practice on principle and hold that only under the most exceptional circumstances can it be followed with impunity. From our experiénce, it would appear that in the majority of instances it is only a matter of time before such wells act as cess pits. Unless most careful provision is made to prevent the liquid manure from soaking into the ground, it sooner or later, according to the nature of the soil, finds its way into the well. If this be so it behooves all farmers and dairymen to locate their well at a safe distance from such infecting sources.

The greatest care should be taken at cheese factories and creameries that the waste water does not find its way into the water supply, and to insure this thorough and efficient drainage is necessary.

Further, there is much room for improvement in keeping the buildings and barn-yard clean. If greater care had been exercised in this matter, many wells might now be free from impurity. Apart from the questions that a dirty barn-yard means a loss of valuable plant food—a question well worthy of closer consideration—there remains the equally important fact that such is usually a menace to health through the contamination of the well water.

The analyses of the waters examined in the Central Farm laboratories during the past year are given in tabular form and condensed reports respecting the quality of the waters is to be found in the last column. A perusal of this table will show that a very many of the samples were seriously and dangerously polluted. We would not have it inferred from this that a similar percentage of Canadian farm wells are in a like

condition, for in all probability only suspected waters are sent for examination, but nevertheless, it reveals a condition of affairs that is by no means satisfactory and one that ought to receive our earnest and immediate attention. The natural waters of Canada, as found in her lakes, streams and springs, are unexcelled for purity—to prove which there are ample data—and we believe there is no insuperable barrier or insurmountable obstacle to obtaining on the majority of farms a pure supply. Once obtained, let it be carefully guarded against pollution.

The samples examined comprise one from British Columbia, six from the North-west Territories, twenty-eight from Ontario, eight from Quebec, seven from New Brunswick, and seventeen from Prince Edward Island. Of these, 50 per cent were reported dangerously polluted and unsafe for drinking purposes ; 25 per cent as suspicious and in all probability as unsafe ; 25 per cent as unpolluted and wholesome.

The examination of well waters from farms only is undertaken. These analyses are made free of charge, provided the sample is taken according to the directions furnished on application, and the express charges are prepaid. It is absolutely essential that the instructions issued should be faithfully followed in the collection and shipment of samples. Farmers and dairymen who are desirous of availing themselves of this privilege should first write to this Division for the necessary information.

ANALYSES OF

RESULTS STATED IN

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.
			1896.				
1	Elmsdale, P.E.I.	W. C. McN.	Nov. 12	·06	·082	3·603	68·0
2	Knowlton, Que.	E. G.	″ 19	·11	·112	5·308	15·8
3	Nappan River, N.B.	Dr. B.	Dec. 4	·03	·43	·008	2·5
4	Ste. Thérèse de Blainville, Que.	C. D. T.	″ 4	·592	·146	·132	3·0
5	St. Williams, Ont.	A. McC.	″ 12	·02	306	2·776	28·0
			1897.				
6	Sussex, N.B.	T. J. P.	Jan. 8	Free.	·02	·0313	44·0
7	″	E. L.	″ 8	·036	·02	·0017	60·0
8	Fort William, Ont.	No. 1, Dr. S.	Feb. 2	·715	·047	·037	1150·0
9	″ ″	″ 2 ″	″ 2	1·340	·114	·0082	3340·0
10	″ ″	″ 3 ″	″ 2	1·955	02	None.	370·0
11	Farm near Burlington Bay, Ont.	No. 22, W. G. W.	″ 17	3·098	·23	·238	1670·0
12	Barton, Ont.	No. 23, F. W. per W. G. W.	″ 17	·08	·068	8·843	60·6
13	″ ″	No. 24, W. G. W.	″ 17	·03	·055	·041	6·0
14	Sussex, N.B.	W. W. H.	″ 18	Free.	·03	1·170	6·6
15	Little Ridgetown, N.B.	A. B.	″ 24	·026	·068	2·004	23·0
16	Lynden, Ont.	D. A. W.	March 8	3·15	·13	4·455	140·0
17	Abernethy, N.W.T.	D. G.	″ 23	·01	·192	0329	1·0
18	Kingston, N.B.	W. S.	″ 27	·115	·125	·680	3·8
19	Branchton, Ont.	J. F.	″ 31	·096	·032	0527	11·5
20	Carievale, N.W.T.	J. T. C.	April 6	·08	·248	None.	1·0
21	Kneehill Creek, N.W.T.	G. B. B.	May 1	·088	·232	·207	8·0
22	Huttonville, Ont.	J. H. C., No. 1	″ 6	·02	·374	6·45	28·2
23	″ ″	″ ″ 2	″ 6	Traces.	·167	3·65	4·0
24	Prescott, Ont.	T. C. per F. J. F.	″ 11	·01	·07	·585	2·6
25	Hintonburgh, Ont.	J. A. O.	June 14	·016	·14	6·545	92·0
26	Kneehill Creek, N.W.T.	G. B. B.	″ 15	·84	·246	·05	15·0
27	Lefaivre, Ont.	W. O.	″ 17	3·198	·196	·156	29·6
28	Regina, N.W.T.	J. A. M., Ind. Sc.	″ 21	1·373	·09	·533	13·2
29	Woodstock, Ont.	J. G. J., "R".	″ 23	·20	·052	·715	3·6
30	″ ″	″ "S".	″ 23	·04	·02	·948	4·3
31	Harriston, Ont.	W. W. McL.	″ 30	·18	·38	None.	42·0
32	Grindstone, Magdalen Isds., Q.	A. S. D. Van B.	July 7	3·60	·26	3·725	110·0
33	Aylmer, Que.	A. C. C.	″ 9	·025	·09	2·36	11·5
34	Ashton, Ont.	S. McK.	Aug. 2	·04	·775	4·858	32·0
35	Gibson, N.B.	T. D. B.	″ 2	Free.	Free.	None.	3·7
36	Summerberry, N.W.T.	J. S. F.	″ 3	·02	·45	″	41·8
37	Rideauville, Ont.	J. B.	″ 10	·52	·20	·346	32·0
38	Douglas Road, Victoria, B.C.	S. E. C.	″ 13	·63	·265	338	60·0
39	Almonte, Ont.	B. R.	″ 18	025	·029	3·782	4·5
40	Chelsea, Que.	W. R.	Sept. 13	·086	·065	·67	4·5
41	″	W. H.	″ 17	·02	·31	6·992	40·0
42	Beechridge, Que.	J. C.	″ 21	Trace.	·48	1·268	3·5
43	Summerside, P.E.I.	R. H., spring	Oct. 14	·05	·045	5188	9·5
44	″ ″	″ brook	″ 14	·08	·45	585	10·0
45	″ ″	″	″ 14	Traces.	·05	6·465	48·0
46	Murray Harbour, South, P.E.I.	C. B.	″ 16	132	·044	4·39	62·0
47	″ ″ ″	W. H.	″ 16	6·658	1·154	20·066	555·0
48	Branchton, Ont.	J. F.	″ 21	·064	Traces.	0198	11·1
49	Milton, Ont.	J. A. R.	″ 26	·032	1·28	1·864	33·0
50	Summerside, P.E.I.	R. H., No. 1.	″ 27	·435	·11	11·71	180·0
51	″ ″	″ ″ 2.	″ 27	Free.	·06	·667	9·6
52	″ ″	″ ″ 3.	″ 27	·04	053	·660	8·8
53	″ ″	″ ″ 4.	″ 27	·025	·04	9·557	55·0
54	Longue Pointe, Que.	F. L.	″ 30	1·080	·052	·089	30·6
55	Kingston, Ont.	I. S.	Nov. 11	1·920	·048	None.	1000·0

WELL WATERS, 1897.

PARTS PER MILLION.

Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
302·8	232·8	70·0	Very heavy traces...	Polluted; use probably attended with danger.
158·8	114·0	44·8	Slight traces..	Seriously polluted.
65·2	8·8	56·4	Very slight traces...	No contamination; pure and wholesome.
....	....	.....	....	Suspicious.
430·8	294·8	136·0	Heavy traces......	Receives soakage; not a good water.
2867·2	2295·2	572·0	Traces.............	Free from pollution; very large amount of mineral matter.
2909·2	2319·2	590·0	"	" " " " "
2078·0	1644·0	434·0	Heavy traces..	Dangerously polluted; unfit for household purposes.
7273·6	4614·0	2659·6	Traces............	" " " "
682·0	630·0	50·0	Very slight traces...	" " " "
3727·5	2617·5	1110·0	Heavy traces.......	A very bad water.
580·0	388·0	192·0	Traces......... .	Highly suspicious.
414·0	352·0	62·0	Heavy traces..	Unpolluted; good and wholesome.
76·0	66·0	10·0	Traces.............	Probably safe and wholesome.
143·5	97·5	46·0	Heavy traces.......	Evidence of contamination; highly suspicious.
594·0	482·0	112·0	Slight "	Excessive pollution; condemned for use.
620·0	412·0	208·0	Very slight traces ..	Free from drainage pollution.
40·0	16·0	24·0	Traces.............	Decidedly suspicious; strong indications of pollution.
2200·0	1790·0	410·0	"	Of doubtful purity.
235·0	155·0	80·0	Heavy traces......	Free from pollution; safe and wholesome.
1107·0	1033·0	74·0	Very heavy traces...	A fair water; probably safe.
792·0	552·0	240·0	" " ..	A very bad water.
252·0	162·0	90·0	Traces......... ..	Of doubtful purity; very suspicious.
364·0	300·0	64·0	....	Entirely free from contamination.
991·2	519·2	472·0	Traces.............	Dangerously polluted.
1226·0	1022·0	204·0	None.........	Very suspicious; probably contaminated.
375·2	285·2	90·0	Slight traces........	Very seriously polluted; condemned.
1180·0	928·0	252·0	Heavy "	Pollution of a most pronounced character; very bad water.
258·0	220·0	38·0	Traces.....	Impure and unfit for use.
304·0	238·0	66·0	Slight traces...... .	Fairly satisfactory; probably safe.
476·0	346·0	30·0	Traces.............	Condemned for domestic use.
463·0	285·0	178·0	Very heavy traces...	Very bad water; dangerous to use.
298·0	190·0	108·0	Traces.............	Suspicious.
234·0	138·0	96·0	"	Polluted with drainage from cheese factory.
254·0	236·0	18·0	Slight traces........	A remarkably pure water.
2782·0	2235·6	546·4	Traces......... ...	No pollution; of the nature of a mineral water.
496·0	384·0	112·0	Heavy traces........	Seriously polluted.
332·0	244·0	88·0	" "	" "
372·0	284·0	88·0	Traces.............	Of somewhat doubtful quality.
216·0	186·0	30·0	Heavy traces......	Suspicious; not first class.
348·0	240·0	108·0	Traces..	Contaminated; dangerous.
172·0	124·0	48·0	Slight traces	Decidedly suspicious.
106·8	86·8	20·0	Traces..............	
117·2	103·2	14·0	Slight traces........	
311·2	255·2	56·0	Heavy "	Seriously contaminated.
342·8	196·8	146·0	Traces.............	Impure; not fit for drinking purposes.
1831·2	1510·0	321·2	Heavy traces......	An exceedingly bad water.
2336·0	1848·0	488·0	None..............	Free from pollution.
1208·0	514·3	694·7	Very heavy traces...	Decidedly suspicious.
1034·8	774·8	260·0	Traces.............	A bad water; use attended with risk to health.
129·2	72·0	57·2	Slight traces........	Unpolluted; wholesome.
116·0	62·0	54·0	" "	" "
406·0	250·0	156·0	Traces......	A dangerous water; receives pollution.
770·0	544·0	226·0	None........... .	Seriously polluted; unsafe for household use.
2194·8	1658·8	536·0	Heavy traces.... ...	Unmistakably polluted; unsafe for household use.

ANALYSES OF WELL

RESULTS STATED IN

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.
			1897.				
56	Lanark, Ont.	R. R.	Nov. 16	4·618	·152	·6638	93·0
57	Hawkesbury, Ont.	R. O. B.	" 17	Free.	·056	6·917	318·0
58	" "	M. W. F.	" 17	Traces.	·092	9·035	33·4
59	" "	T. R.	" 17	·048	·090	1·472	162·0
60	" "	J. H. B. of O.	" 17	Traces.	·048	·299	23 4
61	Summerside, P.E.I	H. S. M., No. 1	" 26	Free.	·062	7·514	60·0
62	" "	Gr. Brk., No. 2	" 26	"	·052	1·308	12·6
63	" "	J. McL., No. 3	" 26	·028	·070	22·460	94 0
64	Alberton, P.E.I	W. C. McN., No. 1	" 27	Trace.	·075	·605	7·0
65	" "	J. L. D., No. 2	" 27	Free.	·041	5·861	47·5
66	" "	" pump, No. 3	" 27	·0325	·025	7·274	85·0
67	" "	M. R. L., No. 4	" 27	Traces.	·012	4·550	23·5

WATERS, 1897—*Concluded.*

PART PER MILLION.

Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
645·2	444·4	200·8	Traces..............	Dangerously polluted; condemned for use.
948·0	604·0	344·0	Heavy traces........	Very heavily polluted; dangerous.
552·0	348·0	204·0	Traces..............	Dangerously polluted; unsafe.
922·0	660·0	262·0	Slight traces........	Polluted and unsafe for use.
516·0	391·6	124·4	Very heavy traces..	Not first class, but probably a safe water.
488·0	377·2	110·8	Traces.............	Seriously contaminated; unsafe to use.
135·2	93·2	42·0	"	Not a first class water.
660·8	502·8	158·0	Heavy traces.......	Heavily polluted; a very dangerous water.
....	....	....	....	Unpolluted; a good water.
....	....	....	....	Polluted; not a safe water.
....	....	....	....	Very seriously polluted; condemned.
....	....	....	....	Polluted and probably unsafe.

REPORT

OF THE

ENTOMOLOGIST AND BOTANIST

(James Fletcher, LL.D., F.R.S.C., F.L.S.)

Dr. W. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to hand you herewith a report on some of the most important subjects which have been brought officially under my notice during the past season.

Many other subjects which have required attention have already been treated of at sufficient length for present purposes in former reports of the Division, or are as yet incomplete. The correspondence during the year has been large and of a varied character. There were 1,920 letters received and 2,110 sent out. During the past year I have had several opportunities of attending meetings in different parts of Canada, and of studying in the field some of the important problems connected with the protection of crops from their insect and fungous enemies.

The experiments with grasses and fodder plants, native and exotic, have been continued and have proved of great interest to visitors. This part of the work of the division is in the charge of Mr. Berthold Nothnagel, who has shown great interest in his work and is untiring in his efforts to explain to all comers the value and nature of the experiments which are being carried on.

The Awnless Brome Grass having proved to be very successful in all parts of the Dominion, about 600 1-pound samples were last spring sent out to farmers in all the provinces. Such reports as have been received up to the present are, almost without exception, enthusiastic in their praises of this valuable grass. A special interest has been added to it lately by the discovery that it is particularly well suited for cultivation on alkaline patches where little else will grow.

During the year several thousands of specimens of plants and insects have been sent in for identification from naturalists in all parts of the Dominion. From these collections several valuable additions have been made to the Experimental Farm museum.

Meetings.—Whenever official duties would permit of my absence, every opportunity has been taken of attending farmers' meetings to meet farmers and to deliver addresses on the work of the Division.

In January last I attended the convention of the Eastern Dairymen's Association at Brockville, Ont., from 6th to 8th of January. The following week I went to St. Mary's, Ont., and was present at the convention of the Creameries Association, 14th to 16th of January. From 20th of January to February 2nd I was in Nova Scotia and New Brunswick, attending meetings of farmers and fruit growers. The annual meeting of the Fruit Growers' Association of Nova Scotia was held at Wolfville on 20th and 21st of January. The annual meeting of the Nova Scotia Farmers' Association was attended at Middleton on 26th, 27th and 28th. On my way back to Ottawa I stayed off at Sussex,

in New Brunswick, and held meetings with Mr. W. W. Hubbard at Hampton, N. B., on 29th of January, and at Sussex, N. B., on the following day. In passing through St. John, N. B., I met the members of the New Brunswick Natural History Society, and examined their museum on Monday, 1st of February. On 2nd and 3rd of March I was present at the annual meeting of the District of Bedford Dairymen's Association, at Cowansville, Que. On 3rd of June, by instruction of the Honourable the Minister of Agriculture, I went to Ste. Thérèse, Que., to examine some "drowned lands," representative of hundreds of acres along the Ottawa River, and to advise what grasses could be most advantageously grown on land liable to be under water during the spring freshet for two or three weeks. Some experiments are being tried and will be reported on later. The next day I started for St. Catharines and met a number of leading fruit growers, with whom I visited the orchard and beautiful grounds of Mr. Charles Thonger, near Niagara, where, unfortunately, the San José Scale has been introduced. I was commissioned by the Honourable Minister to meet these gentlemen and learn from them what their views were as to proposed measures asked for by fruit growers to prevent the spread of the San José Scale. The following morning I was driven by Mr. A. M. Smith to St. David's, to examine an orchard of Mr. Hendershott's, in which the San José Scale was said to occur. This report proved to be inaccurate, the insect in Mr. Hendershott's orchard being the Cherry Scale, *Aspidiotus Forbesi*, Jnsn., a less injurious species. Mr. Smith's nursery was also examined and no trace of the San José Scale was found.

On the following Monday, 14th of June, I left for Nova Scotia, where some meetings had been arranged by the Board of Trade of Kentville, and by the Fruit Growers' Association of Nova Scotia. Meetings were held at Kentville, Berwick and Auburn. The first meeting was largely of townspeople, but there were also several farmers and gardeners present who had been brought together by Mr. M. G. DeWolfe, the energetic President of the Board of Trade. The next day I was driven to Wolfville and had the pleasure of being shown over the School of Horticulture by Prof. Faville. The same afternoon, through the kindness of Mr. Barclay Webster, I was driven from Kentville through the luxuriant orchards of King's county to Berwick, where a good meeting had been convened by Mr. S. C. Parker, the Secretary of the Fruit Growers' Association of Nova Scotia. The morning of the 18th was devoted to examining the well-kept orchards of Mr. Parker and others at Berwick. In the afternoon I proceeded to Auburn, where I was met by Mr. J. S. Bishop, and driven through the surrounding country, visiting the cranberry bogs which have been so successfully worked for the last few years. In the evening a well attended meeting of cranberry growers was addressed and Cranberry insects were discussed. The next day I returned to Kentville and then went on to Halifax to attend the meeting of the Royal Society of Canada. I left Halifax for home on 23rd of June. On 3rd of July I proceeded to Manitoba by instruction of the Hon. Minister of Agriculture and at the request of the Manitoba Government. In company with Mr. Hugh McKellar, the Deputy Minister of Agriculture, I held a series of meetings in some of the important wheat growing districts of the province. Meetings were held at Neepawa, Gladstone, Dauphin, Glenlyon on the Gilbert Plains, Portage la Prairie. Brandon, Beresford, Blythefield and Glenboro'. The subject treated of at all these meetings was "Noxious weeds, their nature and habits and the best means to adopt for their eradication." We were accompanied at some of these meetings by the Rev. W. A. Burman, Mr. George Greig, of Winnipeg, and Mr. J. B. Hobson, of Guelph, who all took an active and useful part in the meetings. I returned to Ottawa again on 22nd of July. On 12th and 13th of October, I attended the annual meeting of the Entomological Society of Ontario at London, Ontario.

Acknowledgments.—As in previous years, I am under great obligations to my friends, Prof. John Macoun and Mr. W. H. Harrington, both of Ottawa, for frequent assistance in the identification of difficult plants and insects. I also take pleasure in again acknowledging the valuable assistance I have received from my many correspondents in all parts of the Dominion, who have much aided the work of the Division by making observations and by sending me prompt notice of the occurrence of injurious insects and weeds. My thanks are also particularly due to Dr. L. O. Howard, the

United States Entomologist, and his staff at Washington, as well as to Dr. C. H. Fernald, of Amherst, Massachusetts, and Lord Walsingham, F.R.S., of Merton Hall, Thetford, England, for many favours in identifying insects and for valuable publications

I again thank my kind friend, Miss E. A. Ormerod, for her most useful publications and valuable advice. On the occasion of a short visit to England in August last I had the great pleasure of again calling on this energetic worker and of learning from her many things of great use to me in my official duties.

The following donations have been received during the year:

Prof. J. Lamson Scribner, Washington: A large collection of seeds of grasses and fodder plants.

M. G. DeWolfe, Esq., Kentville, N. S.: Several living roots of greenhouse plants, bulbs and perennials.

T. W. Ramm, Esq., Bewdley, Ont.: Insects.

Rev. G. W. Taylor, Gabriola Island, B. C.: British Columbia plants and insects

T. N. Willing, Esq., Olds, Alta.: Rare plants and insects from Alberta.

In conclusion, I beg again to acknowledge the great help I receive continuously in all branches of the work of the division from my assistant, Mr. J. A. Guignard, B.A., who has done much by his assiduous attention to bring the Division of Entomology and Botany to such degree of efficiency as it has attained.

I have the honour to be, sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist.

CEREALS.

The large wheat crop of the Dominion was got in for the most part in good condition. In some sections of Ontario late rains were a cause of loss, from the grain sprouting in the field. There was no serious damage from injurious insects in any of the provinces, although in Manitoba some loss resulted from an unknown cause, by which many ears of wheat turned white before the grain was mature and the stems remained standing in the field; this injury was spoken of generally as "dead heads" and was in places of much importance. It was thought by some to be due to the attacks of a fungus, but other observers spoke positively of finding insects which were actually attacking the roots. From the information given by correspondents, I judge that this was not the work of the Wheat-stem Saw-fly (*Cephus pygmæus*, L.) treated of in my last report but of a dipterous larva. During the past summer the perfect flies of *Cephus pygmæus* were reared from straws sent from Souris, Man., by Mr. Wenman, thus proving without doubt the identity of the species which injured Mr. Wenman's wheat last year. During the past summer some harm was done by the same insect near Indian Head, N.W.T.

With regard to the "dead heads," Mr. A. C. Hawkins, of Swan Lake, Man., writes —and his opinion seems well supported:—"I still think that the 'fungous disease' is an after effect and not the cause of the death of the wheat plant, the cause being, in my opinion, the larva forwarded in my last letter which you could not find, but of which, at the time that it was collected, I had no difficulty in finding many more than I wanted, one or two in the root of every plant I examined of which the heads were just beginning to dry up."

Mr. A. W. Pritchard, of the Manitoba Department of Agriculture, writes:— "Numerous reports have been received by the Department, of damage done to the wheat crop by an insect which is commonly spoken of as attacking the root, though some of our reporters call it a 'Joint-borer.' The effect of its attack is everywhere the same, to cause the plant to turn white and produce an empty head. The ravages of this insect, if insect it be, have extended over a large area. The damage done is reported is some cases as much as one-half the crop."

Arrangements have been made to study this attack more fully next year, and specimens of injured stems will be thankfully received.

The JOINT-WORM (*Isosoma*).—An attack on wheat by a joint-worm is reported from Verdun, Bruce Co., Ont., by Mr. William Welsh, who has studied the matter with some care. He writes as follows:—

"July 28.—The year before last was the first when I noticed this new pest; it was, detected in the broken straw at threshing time, the larvæ of the insect being easily seen by splitting the hard pieces of broken straw with a sharp knife. Last fall there was much more of the broken straw in the threshed grain. It seems almost impossible to get thes e pieces out with the fanning mill, and consequently many larvæ are sown with the fall wheat. I think this insect must have had much to do with the injured grain of last fall. On looking in the bins of wheat at mills or elevators, I became convinced that this insect is worthy of full inquiry and that it is rapidly spreading here.

"November 25.—Since corresponding with you I have felt much interest in this subject, and have made special observations and inquiries concerning the joint-worm. I send you by this mail specimens of infested straws which I have picked from the fall wheat stubble. The piece of ground where I had my fall wheat having been seeded to clover gave me a chance of getting some specimens nearly as good as those I sent before harvest. I also inclose some samples of the broken straw as found in threshed wheat. You will find that these short pieces are hard and woody from the action of the insect upon the growing stem. The pupæ are still alive and ready in the warm days of spring to eat their way out and go through the same routine as their parents before them. In

some of the pieces of straw, a little over an inch in length, there may be found from five to ten insects. A bushel of such straw lying loose about a barn would give enough insects to destroy many fields before the grain ripened. I think you will agree with me that every farmer should see that the cleanings from the fanning mill are either fed or burned to destroy the insect."

Remedies.—As stated by Mr. Welsh, the broken hardened pieces of straw noticed when threshing and cleaning grain should be collected and burned. The grain should also be examined for these pieces which should be picked out by hand.

Most of the galls or hardened sections of stem in which the insect passes the winter are low down near the root. The burning of stubbles and deep ploughing are therefore useful in destroying large numbers of the pupæ. The term "joint worm" probably covers more than one species of minute hymenoptera which attack the stems of wheat and barley; but, fortunately, the attack is of rare occurrence in Canada, and there have been few opportunities of examining the mature insects.

Young plants of fall wheat sent by Mr. Welsh from Verdun in November were found to be attacked by both Hessian Fly and the Wheat-stem Maggot. These two pests were also somewhat abundant in Prince Edward Island. Mr. Edward Wyatt, writing from Pleasant Grove, P.E.I., September 18, says:—"The Frit Fly for many years now has been doing considerable harm to our wheat and hay crops. The Hessian Fly I have no doubt is the principal aggressor, but the Frit Fly and Wheat stem Maggot have been associated with it. Some of the maggots which infest the straw are of a yellowish colour, others are green. These pests have been on the island continuously for the last 17 years. The damage was slight until the last three or four years. Many who sow early have poor crops and with no knowledge of the cause. We all sow now from May 20 to 24, thus escaping the first attack which, if bad, ruins the crop. We have never grown better wheat crops than in the past two years—that is, generally; fully one-third of my wheat this year fell down two weeks before it was ripe, still the crop was a fairly good one; but should the season prove favourable to these pests, the damage might be serious."

The Grain Plant-louse (*Siphonophora avenæ*, Fab.)—Specimens of wheat and oats attacked by the Grain Plant-louse have been sent in from several localities. The worst attacks were reported by Mr. John Tolmie, of Cloverdale, Victoria, B.C., on oats and by Mr. Lewis Rogers, of Cooksville, Peel Co., Ont., on fall wheat, where much damage was done to the young plants in October and early in November. In a case of this kind, if the vigorous wheat plants which have passed the winter are found to be too few in spring for a paying crop, clover may be broadcasted over the land before rolling, or the crop may be helped with a top dressing of some special fertilizer.

Grasshoppers.—A noticeable feature of the correspondence of the division during the past season, as compared with last year, was the almost total absence of complaints of injury to farm crops by grasshoppers. This state of affairs was anticipated on account of the abundance of parasites of several kinds noticed last year and mentioned in my report for 1896. Hair-worms (*Gordius*) have been sent in from Ontario and Quebec more frequently than any other parasites. The account of the strange life-history as far as known, never fails to excite the interest of inquirers. The only localities from which grasshoppers have been mentioned as injurious are: Sable Island, N.S., where they destroyed Brome grass which was being experimented with as a sand binder; Manitoulin Island, Ont., where they did much harm to turnips; and parts of Peterborough County, Ont., where hay and oats suffered to a limited extent from their ravages.

Fig. 1. The Red-legged Locust.

THE PEA WEEVIL OR "PEA BUG"

(*Bruchus pisi*, L.).


Fig. 2.—The Pea Weevil—natural size and enlarged.

Attack,—A small, brownish gray, very active beetle, ⅛ of an inch long, with two conspicuous black spots on the end of the body, which emerges from seed pease in autumn or in spring, leaving a small round hole. This insect is generally spoken of under the incorrect name of "pea bug," and infested pease, as "buggy" pease. The egg is laid on the outside of the young pod, and the grub, on hatching, eats its way in and penetrates the nearest pea. Here it remains until full-grown, consuming the interior of the pea and passing through all its stages from a white fleshy grub to the chrysalis and then to the perfect beetle. Some of the beetles, the percentage varying with the season, escape from the pease in the autumn and pass the winter hidden away under rubbish or about barns and other buildings. The greater number, however, do not leave the pease until the following spring, so that they are frequently sown with the seed.

The perfect insects fly easily and resort to the pea fields about the time the blossoms appear. They have been observed feeding upon the leaves and flowers of the pea vines before the pods were formed, but the injury so done is inappreciable compared with the much greater loss from the injury to the seeds by the grubs.

From the large numbers of beetles which I once found dead, after a severe winter, beneath the shingles of a barn, I am led to believe that, in those seasons when a large percentage of the beetles issue in the autumn, many are apt to be destroyed by severe cold.

Frequent inquiries come in every year for information concerning the Pea Weevil and the best means of preventing its injuries.

During the past season, from such reports as have been received, it would appear that on the whole the Pea Weevil has not been quite so injurious as in former years. Some correspondents, however, report that the injury is still considerable.

"Picton, Prince Edward Co., Nov. 6—Our big pea houses report that the Weevil this year was not as bad as usual. Every effort is now made to destroy the Weevil by what is called "bugging" the pease as soon as they are received from the farmers."—[Wellington Boulter.]

The insect itself and its life history are now well known in the districts where it occurs; and, if more care were taken to sow only uninfested pease or those which have been properly fumigated, there would be no difficulty in reducing very considerably the numbers of this pest, which every year affects so materially the value of the pea crop of the Dominion. There are vast areas in Canada where good seed pease can be grown as a paying crop, and where the Pea Weevil does not occur at all. The advantage of obtaining seed from these districts is obvious and has already been recognized by some of the large seed firms. In addition to this, the method usually adopted of killing the weevils, either as grubs or as perfect beetles inside the seed pease, by subjecting them to the fumes of bi-sulphide of carbon, is perfectly effective. Most of the seed houses at the present time treat their seed carefully and conscientiously, and the injury to the crop is now done chiefly by grubs from eggs laid by weevils which have either left the pease in the autumn and wintered over, or else from pease saved for seed in small quantities by farmers who took no steps to destroy the weevil before sowing time.

Writing early in the present season, Mr. T. G. Raynor, of Rose Hall, Prince Edward Co., Ont., says:—"I do not think the pea weevil was nearly as bad in this county in 1896 as in previous years. Perhaps the season had something to do with it.

Still, every year for some time past, there have been fewer pease owned and sowed by the farmers themselves. The company pease, which are treated for the bug, have replaced the others. This must necessarily have its effect for good. I have no doubt that the pease had more bugs in them than was generally supposed, as the fancy pease grown here are cut and marketed early, before the weevil has developed much or can be detected, and the pease are generally treated for the bugs as soon as they are marketed."

Late sowing is sometimes recommended as a preventive remedy, but is more or less uncertain in its good effects according to the season, and has never become very popular, although the method has always a few adherents in all districts visited, the idea, of course, being to delay the development of the pease until after the season when the weevils lay their eggs. The chief danger is that late sown pease are apt to be attacked by the ordinary white mildew of the pea, which reduces considerably the crop.

I quote from my annual report for 1890, a statement by Mr. J. H. Allan, of Picton, Ont., one of the best informed authorities in the pea trade:—"Many of our farmers sow the late sorts of pease late in the season—say, the first part of June—with good results. I have seen a field of Golden Vine pease sown early in May. The crop was literally filled with bugs. The neighbour of this farmer planted his in June, and his crop had none. I would say, plant as late as possible; but this will not answer for all kinds. The extra early varieties must be put in as early as possible to insure a paying crop."—(*Report of Ent. and Bot., C. E. F. Report, 1890*, p. 173.)

"Weston, York Co., Ont., March 8:—The pea weevil, which eats out the centre of the pease in the barn, around here destroys about one quarter of the crop. Some people sow late to escape the weevil, but they do not get half the crop as when they sow early. To sum up, if you sow early, you get a good crop of pease and weevil. Sow late, you get a poor crop of pease and few weevils. We sow about forty acres of pease on our 250 acre farm."—[J. La F. Stonehouse.]

Remedies.—Bisulphide of Carbon.—Where the crop is large, undoubtedly the wisest course to adopt in districts where the pea weevil occurs, is to fumigate the pease with bisulphide of carbon as a regular practice as soon as possible after harvesting. In this way, any weevils contained in the pease will be destroyed in the grub state before they have consumed much of the substance of the pease in which they are undergoing their transformations. This may be done by placing the infested seed, according to the quantity to be treated, in some suitable receptacle, as a tight barrel, box or bin, or, if the quantity is large, in a specially prepared building. Mr. Allan describes his method, which is practically that generally adopted, as follows: "Nearly every large grower has a building for the purpose. If properly made, it works well. The whole building must be very tight to be of any use. Some use tin, others cement and paint and paper lining, with a double floor and tarred paper between. The pan we use to put the carbon bisulphide in is about three feet across and only about four inches deep. The chemical is thus exposed to more air than it would be in a deep dish, from which it could not evaporate quickly enough to do good service. I put my pan up close to the ceiling above the pease, because the vapour, being so much heavier than air, works down through them. We fill the building with bags as close as possible up to where the pan hangs, empty the bisulphide into the pan and get out as quickly as possible, close the door up tightly and leave it for 48 hours. This must be done in warm weather, as the liquid does not vaporize well when the temperature is lower than 10 degrees above zero." (*C. E. F. Report, 1890, loc. cit.*)

Perhaps the most convenient receptacle for treating weevilly pease, for farmers, is an ordinary 45 gallon coal oil barrel, into which 5 bushels of pease may be put at a time; the quantity of bisulphide of carbon which has been found necessary is one ounce to every hundred pounds of seed; therefore, for the above quantity three ounces should be poured into some flat pan placed on the top of the seed or sprinkled over the surface, and the barrel covered closely, first with a thick cloth or canvas which has been damped in water, and then with boards. The barrel should be in an outside shed and left closed for 48 hours.

Bisulphide of carbon is a colourless liquid which volatilizes very readily at ordinary temperatures; the vapour, which is quite invisible but has a strong unpleasant

odour, is heavier than air, and therefore sinks readily to the bottom and permeates the whole contents of any closed receptacle in which it is used to free grain of infesting insects.

Great care must be taken in the use of this chemical on account of the extreme inflammability both of the liquid and its vapour. No fire, such as a flame or even a lighted pipe or cigar, must be taken near either the liquid or the bin in which the pease have been treated, for some time after it is opened and the heavy and inflammable vapour has been let out. Treating seed of any kind with bisulphide of carbon has no deleterious effect upon the vitality of the seed nor upon its wholesomeness as food.

The question sometimes arises whether pease badly infested with weevils can be used safely for feed. I find upon inquiry that it is a general practice to grind up weevilly pease and use them for feed, and no injury to stock has been reported so far. Mr. T. G. Raynor, answering this very question in the *Farmer's Advocate* for March 1, 1897, says :—"The cull pease from re-cleaning the pease at the seed houses, after being treated for the bug, are used for feeding purposes, and I have not heard of any injury." Mr. Wellington Boulter, the Mayor of Picton, Ont., one of the most important centres of the seed-pea trade in Canada, also writes as follows :—"November 26.—*In re* your inquiry as to grinding pease infested with pea-weevil for pigs, injury to stock, &c., I would most emphatically say no injury could happen. I have ground up quantities in the past. I have also fed pigs with the pease in the natural state and never heard of any injury. In grinding, the bugs would be ground to powder."

Holding over seed.—Some people may not care to have such a dangerous material as bisulphide of carbon about their premises. For such, an excellent remedy is holding over until the second year after harvesting any pease required for seed. This may be done in the case of pease without any injury to their vitality. They should be inclosed in paper or cotton bags, which will be sufficient to prevent the beetles from escaping when they emerge. At the time of sowing the pease, they should be examined and if necessary hand-picked; every grain which has been perforated should be discarded, as frequent experiments have proved that it is impossible to grow strong plants from weevilled pease, although unfortunately there is a widespread belief to the contrary.

The PEA MOTH (*Semasia nigricana*, Steph.).—This enemy of the pea, which has been treated of in former reports without a specific name, has this year been identified (from specimens bred from larvæ collected last year at Ottawa) through the kindness of Prof. C. H. Fernald, of Amherst, Mass., who writes :—Your pea insect was greased and unspread, and therefore difficult to determine; but I believe it to be *Semasia nigricana*. which is now considered distinct from *nebritana*, Treits, under which it was placed as a synonym by Wocke in Staudinger's Catalogue. It is probably identical with *pisana*, Guen., and has long been placed under the genus *Semasia*, but Meyrick in his *Handbook of British Lepidoptera* puts it under the genus *Laspeyresia*, Hbn.

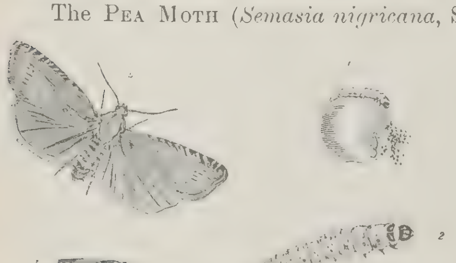


Fig. 3.—The Pea Moth—natural size and enlarged.

The accompanying figure has been kindly supplied for this report by Messrs. Blackie & Son, of Glasgow, Scotland. It is by John Curtis, and was used in his great work "*Farm Insects*."

Six specimens of the moth were bred, and all emerged between the 12th and 15th of July. As the cocoons were kept under natural conditions this is probably the time when the moths appear in nature, which would emphasize the value of the remedy already suggested of early sowing. The moth is small and inconspicuous, $\frac{1}{4}$ of an inch long when the wings are closed, mouse coloured, bronzed towards the tips of the wings, silvery gray beneath. The only markings are along the front margin or costa and near the apex of the upper wing. The costal marks consist of about 10 or 12 short black triangular streaks, separated from each other by similar clear white dashes all directed backwards ; two of the black streaks, however, the third and fifth, which start from

about the middle of the costa, are much longer than the others and run parallel to each other diagonally one-quarter across the wing towards the apex; these are narrowly margined with bronze scales and broadly shadowed on the side towards the apex with bands of pearly gray scales. These bands run right across the wing and unite at the other margin, thus inclosing a somewhat oval or flask-shaped space, which bears in its centre 4 or 5 short longitudinal dashes and also includes in its neck the outer of the two long black diagonal streaks from the costa.

The injury from the caterpillars of the Pea Moth was not so marked in Ontario and Quebec as in previous years, but in the Maritime Provinces it has been as wide-spread as usual. Mr. J. E. Wetmore, of Clifton, King's Co., N. B., sent me on 16th of September last several pods of Stratagem and Crown peas, also of the wild Tufted Vetch, *Vicia Cracca*, with the following notes: "I find that they attack the Stratagems in all stages of growth, from the most immature to those nearly ripe. I have found but few in the green Crown pease. In this variety they are almost always among the ripe ones. Nearly every pod of Stratagem is affected, while but about one-third or one-quarter of the Crown pease are attacked. Early pease ripening in July are not liable to be attacked, but, as the season advances, their numbers increase till the tender late varieties are almost wholly destroyed. I have examined some pods to see where the attack generally occurs. I thought it was always at the upper end, but of fourteen specimens before me three are attacked at the upper end and three at the lower end, while eight are at intermediate points, so that there does not seem to be any regular spot for the egg to be laid and the young caterpillar to enter the pod."

"Berwick, King's Co., N. S., 26th November.—The Pea Moth has been very destructive to both garden and field pease."—[S. C. Parker.]

ROOT CROPS AND VEGETABLES.

Garden vegetables and root crops during the past season have been little attacked by insect pests.

Cutworms.—There have been the usual local occurrences of cutworms in different parts of the Dominion; but, with the exception of a severe outbreak on Vancouver Island, there was no widespread devastation complained of. No mention of cutworms was made in the provincial crop reports of Ontario, Nova Scotia, or Manitoba. Rev. Father Burke reports from Prince Edward Island: "Cutworms seem to dislike a wet season, like some other insects. We were relieved very much in this respect last spring."

"Yarmouth, N.S.—Cutworms were not as destructive as usual."—[C. E. Brown.]

"Clifton, King's Co., N.B.—Last season cutworms were very destructive here, so that it was almost impossible to raise any vegetables; this year there have been very few losses from them. 1896 was very dry; this season, 1897, has been moist and cool; would this account for the difference in their numbers?"—[J. E. Wetmore.]

"Victoria, B.C., Nov. 8.—Cutworms were numerous and destructive this spring and destroyed quantities of young garden stuff."—[R. M. Palmer.]

"Thetis Island, B.C., June 3.—I send specimens of an insect which is working havoc to the root crops here; my onions are all gone, and beets and carrots are slowly disappearing; it cuts off the young plants close by the ground."—[Peter Hunter.]

"Mattawa, Nipissing, Ont., June 21.—Inclosed find grubs which are working great havoc in crops attacking almost everything in the shape of vegetables, particularly beans, corn and cabbage."—[C. G. Hurdman.]

"Stonefield, Argenteuil Co., Que., June 25.—The farmers in this neighbourhood, who have sown feed corn, are troubled to a serious extent by a grub, which cuts off the young plant as soon as it appears above the ground."—[Reuben Wilden.]

"St. Patrick, Temiscouata Co., Que., June 26.—All the gardens in this neighbourhood are suffering from the depredations of a grub, which is devouring all the young

vegetables. It is a common grub, but is in such unusual numbers that the poor people fear that every vegetable will be destroyed."—[Mrs. D. W. Macdonell.]

No new remedies have been discovered for these troublesome pests of the garden and farm. The remedies given in my last report have been found very serviceable, particularly the poisoned bran remedy, when the material was used either dry or moistened.

Potatoes have been an uneven crop, very good in many places, but in as many others, there was loss from neglecting to use Paris green for the Colorado Potato-beetle and to spray for the potato-rot. Mr. W. W. Hubbard, of Sussex, N.B., the editor of the *Cooperative Farmer*, says:—"We had a very wet spring with considerable damp, sultry weather through the summer, and this was very favourable to spore growth. Potatoes were early struck with rust. Scarcely any one will use the Bordeaux mixture." This is a great pity, for the results of spraying to prevent the potato-rust, which later produces the potato-rot, are so marked that any one who will try a small experiment, must be soon convinced of the value of this remedy.

BLISTER-BEETLES.—The Black Blister Beetle (*Epicauta Pennsylvanica*, DeG.) appeared in large numbers at St. Denis, Kamouraska Co, Que., on potatoes. Several specimens were sent by Mr. J. C. Chapais. The Gray Blister-beetles (*Macrobasis unicolor*, Kirby) did much harm to potatoes and beans at South River, Muskoka, Ont., and Mr. J. I. Sheil, having read in previous reports of the difficulties of some of my correspondents in treating these insects without injuring the crop, tried some experiments with the insecticide "Slug shot," which he prefers very much to the ordinary mixtures of Paris green used for this insect, finding it equally effective, with no danger of injuring the foliage of the plant treated.

APHIDES or plant-lice were very abundant last season, almost everything being attacked severely. No specimens were received, but several correspondents refer to injury to carrots by a species of plant-louse which spotted the foliage and stunted the roots of the carrots. This occurred in Ontario, Quebec and Nova Scotia. Mr. C. E. Brown, of Yarmouth, N.S., reports:—"Among hardy vegetable crops there was injury and in some cases there was a total loss of carrots from the attacks of aphides. These pests were prevalent not only throughout this county, but in the adjoining counties."

THE CARROT RUST-FLY (*Psila rosæ*, Fab.).—*Attack.*—Early in the season the leaves of young carrots turn reddish and the roots will be found to be blotched with rusty patches, particularly towards the tip. These carrots when stored for winter use, although sometimes not showing much injury on the outside, may be found to be perforated in every direction by dirty brown burrows, in which are many semi-transparent yellowish maggots about $\frac{1}{4}$ of an inch long. These maggots are blunt at the tail end, but taper toward the head, where is a black hooked tip, forked at the base, by which the maggot makes its way through the the roots. The puparium is reddish-brown, and the maggots, as a rule, leave the carrots before assuming this form. The fly and its work are shown very well in the figure (Fig. 4) by John Curtis, which I am able to present herewith through the courtesy of Miss Ormerod and Messrs. Blackie & Son. The mature fly is two-winged, $\frac{1}{4}$ of an inch long, bright shiny black, with yellow legs and red eyes. The wings are beautifully iridescent. The winter is passed either as a maggot or in the puparium. Miss Ormerod, the eminent English entomologist, who has studied the insect for many years, describes the attack as follows:

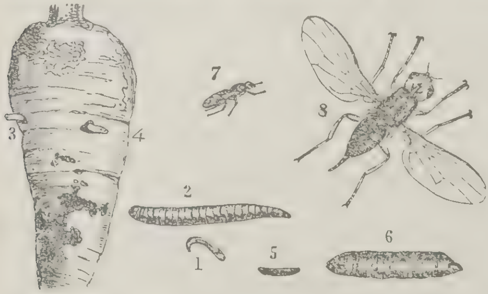


Fig. 4.—The Carrot Rust-fly—natural size (1, 5, 7), and enlarged (2, 6, 8.)

"The method of life of the Carrot Fly is to go down into the ground, where she can find a chink or cranny by the carrots. There she lays her eggs on or by the roots,

and the little yellowish or whitish maggots which hatch from these work their way into the root itself, or, if this is still very small, often destroy the lowest part. When full fed they leave the carrots and turn to the chrysalis state in the ground. The chrysalis cases are cylindrical and of a rusty or ochreous colour, and from these (in summer) the little blackish-green, two-winged flies, with rusty, ochre-coloured heads, come out in about three or four weeks." (*E. A. Ormerod. Ann. Rpt., 1898*, p. 11.)

During the last ten or twelve years occasional complaints have been received of injuries to carrots by the larvae of the Carrot Rust-fly. These have been mostly from the province of New Brunswick, but also once or twice from Ontario and Quebec. This attack is a serious one, the carrots stored for winter use being rendered useless for the table from the discoloured burrows of the numerous maggots which sometimes occur in a single root. In 1895, Mr. J. S. Armstrong, of Rothesay, King's County, N.B., who had suffered severely from the ravages of this insect, noticed that late sown carrots were less injured than those sown at the ordinary time. This practice has since been recommended, and has been adopted with considerable success.

"Upper Sackville, Westmoreland Co., N.B., March 4, 1896.—My son William has written me that he was talking to you about the carrots we grew in our garden the past two years. He wished me to send you a sample; but they were so badly affected in the fall that we fed them to the cattle. I send you 2 small roots I found in the cellar. They will show the disease, but they do not represent the growth, as they are too small. The crop was large enough, but I think every carrot was diseased. It was in 1894 that we first noticed that something was wrong. In 1895 I planted in another place, but they were no better. Carrots had been grown on the same land previous to 1894 and were sound and good."—[John Fawcett.]

"Brookville, St. John Co., N. B, Dec. 20, 1896.—I send you carrots badly infested by some maggot which entirely destroys them, burrowing in every direction through the root. The carrots came up well, but after I weeded and thinned them they began to wither down in spots. The remainder seemed to grow pretty large, but when pulled were all full of maggots and are not fit for use."

"Feb. 15.—In reply to your letter, I sowed my carrots the first week in May. I have made inquiries of some of the farmers here and find that those who sowed later had their carrots not nearly so badly attacked as mine. Do you think cropping the same ground year after year would affect the roots?"—[Benjamin Hevenor.]

"Upper Sackville, Westmoreland Co., N.B., Jan. 5, 1897.—I sowed a much larger patch of carrots on another part of my farm later in May and had an excellent crop. No appearance of the maggot; but last year ours were so bad that we had to buy for table use. The man we bought of lives some eight miles from here. This year his carrots are affected, to all appearances as ours have been. I know of no other cases. He has been growing carrots on the same plot for some time."

"Dec. 15.—We have had no trouble with carrot-fly this year since we changed the place of cultivation. I have heard of another attack, however, on a friend's place ten miles distant. I will send you some infested roots as soon as I can get them."—[W. W. Fawcett.]

"Clifton, King's Co., N. B., Sept. 16.—I find it almost impossible of late years to get a crop of carrots on account of a small white grub which attacks the roots from the time they are very young and continues its ravages throughout the season."

"Dec. 10.—In reply to your favour inquiring about injury to my carrots this year. Last year they attacked the carrots severely. I did not harvest more than one third of a crop. This year they attacked the young plants and cut them down very badly in my field, and in disgust I ploughed them under and sowed late turnips. From appearances, had I left them, I would not have had more than one sixth of a crop, if any at all. One of my neighbours had about one-third of a crop, and another still less. There are very few carrots raised here of late years, on account of this pest."—[J. E. Wetmore.]

Remedies.—Where remedies have been applied by my correspondents, the best results have been secured by the use of ordinary coal oil, either in the form of sand saturated in the proportion of one half a pint of coal oil to three gallons of dry sand, ashes or land plaster, which was sown at short intervals along the row, or of kerosene

emulsion, one part of the ordinary Riley-Hubbard formula to 10 of water sprayed along the rows.

Miss Ormerod gives the following advice :—"For prevention of attack generally, what is needed is a well prepared soil which will push on good growth of the plant, and also not be liable to crack, and also such management of ground and plants at thinning-time as will not allow the Carrot Fly to get down to lay its eggs by the roots. *This point is the important matter in the prevention of the Carrot-grub attack, commonly known as 'rust.'* If the fly *cannot* get to the roots to lay her eggs, obviously there will be no maggots to harm them, and the reason why carrots which have done well up to thinning-time often fail afterwards, is *because the ground is thrown open* in the operation.

"I always advise that the greatest amount of thinning that can be managed should be done as early as possible, then give good waterings after thinning, and from time to time afterwards to drive the surface soil together."

From our Canadian experience it would appear that late sowing has a particularly good effect. When carrots are grown as a farm crop, it is, of course, well to sow them as early as convenient and thus secure as heavy a crop as possible; but, for table use, I have found by experiment that this vegetable may be sown very much later than is the usual practice, and, if frequently hoed or cultivated, will give a good crop of excellent roots, while at the same time the danger of loss from the Carrot Rust-fly will be much lessened. Carrots sown as late as the third week in June produced a crop of table carrots of good size and excellent quality.

Where this fly is known to be prevalent, carrots should be sown every year as far distant as possible from land which is known to have been infested. Where carrots are stored during the winter in sand or earth, this, of course, must be treated to destroy the pupæ which leave the roots and enter the soil to pass their last preparatory stage. Miss Ormerod suggests that this earth might be put into a wet manure pit so as to prevent the hatching out of the flies. Should neither of these methods be convenient, at any rate, it might be buried in a deep hole dug in the ground for the purpose.

THE SPINACH CARRION-BEETLE (*Silpha bituberosa*, Lec.).—*Attack.*—Shiny black, very active, flattened grubs $\frac{3}{4}$ of an inch in length, shaped like wood-lice, which devour the leaves of plants belonging to the spinach or goosefoot family (*Chenopodiaceæ*) and also members of the Gourd family. In my Report as Entomologist for 1893 is given an account of injuries to crops by this carrion-beetle. During the past summer there was a new outbreak at Calgary, Alta. Mr. E. D. H. Wilkins writes :—"May 30.—A black grub is swarming in my garden this spring and devouring the leaves of the spinach and beet. I also find it on the weed commonly called lamb's quarters. Please advise me as to a remedy, for this grub is doing a great deal of damage, and I do not like to use poison on the spinach leaves."

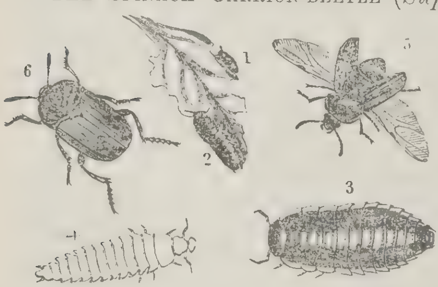


Fig. 5.—Carrion-beetle (5, 6); larvæ (1, 3, 4).

"June 13.—I sent you a few days ago some more grubs, as you wished. I have tried Paris green traps and used overgrown spinach plants. We have had only five hours' rain this year, so that it is a struggle to keep things going. There is very little succulent vegetation to use for traps such as you suggest. Your advice about keeping the place clean of all weeds is more to the point here. Last year I was careless and let lamb's quarters grow in great quantities in waste places in the garden. That is evidently why I am now plagued with these beetles. After trying the Paris green traps I counted twelve corpses in one row. I am satisfied that with these, as I have found it is the case with cutworms, the best preventive measure is to clean up everywhere and leave no weeds or lamb's quarters growing, so that the insects can have no chance to breed."

Remedy.—The only remedy which can be suggested for this insect when it attacks such plants as beetroots and mangels is to dust the young plants at the end of May and during the first part of June, when the grubs appear, with a poisonous mixture such as Paris green and some powdery diluent, *e. g.*, flour, land plaster or ashes, one part to 50. In the case of spinach, it may be necessary to cover the plants with netting or cheese cloth for a time ; or a more attractive food plant such as lamb's quarters, or the native weed of the West, *Monolepis*, which is stated to be the favourite food plant of this insect, may be sown close to the spinach to draw off the attack.

FRUITS.

The fruit crop of Canada for the year 1897, although in no way comparable for quantity with that of last year, has been, on the whole, a good crop, and where spraying has been adopted good profits have been made. It is to be regretted, however, that some of our less progressive fruit growers have not yet adopted this most useful means of saving money. This is in some measure due to the ignorance of fruit buyers, who, it seems, cannot be taught that there is not the slightest danger from the use of fruit from trees which have been sprayed, and that, if sufficient poison were used to make the practice dangerous, the fruit grower would be the first to suffer, because the amount of poison necessary for that would cause both leaves and fruit to fall from the trees long before the fruit was ripe.

It would take too much space to give extracts from letters of practical business men who have learnt from experience the value of the practice of spraying against injurious insects and fungous diseases ; but hundreds might be cited.

Among fruit insects of the present season the San José Scale has been the subject of extensive correspondence ; but many other insects which, except for the anxiety thus aroused, would not have attracted notice, have also been inquired about. Some of those species which may be called the standard pests of the orchard and fruit garden, have been less in evidence than usual. Next to the San José Scale, TENT CATERPILLARS called for most information, and occurred in injurious numbers both in orchards and upon forest trees. In the Ottawa district basswoods (*Tilia*) were much injured and groves of aspen (*Populus tremuloides*, Michx.) for many miles along the Ottawa River were stripped perfectly bare of foliage in the month of June. At Bewdley, Northumberland Co., Ont., Mr. T. W. Ramm, says :—"I never saw so many Tent Caterpillars as there were here this spring." Mr. Ramm also bred from the cocoons several specimens of the useful "ichneumon fly" *Pimpla pedalis*, Cress. Mr. F. W. Payne sent specimens of the Forest Tent Caterpillar from Hall's Glen, Peterboro' Co., Ont.:—"July 17. As I drove along the road $2\frac{1}{2}$ miles from here, I noticed that the maple trees were defoliated to the extent of $\frac{1}{3}$ to $\frac{2}{3}$ of their foliage, and hundreds of moths were flitting through the branches. The cocoons hung in the maples, by hundreds, one to each leaf with the edges drawn together by a web."

Fig. 6.—Forest Tent Caterpillar.

Tent Caterpillar injuries are also reported from the Annapolis Valley, Nova Scotia, by Mr. S. C. Parker, of Berwick, and Mr. M. G. DeWolfe, of Kentville, N.S. ; and in Manitoba Mr. H. W. O. Boger found them unusually abundant at Brandon, attacking currant bushes, roses, choke cherries and the mountain ash.

In British Columbia these insects swarmed on every hedge and also did much harm in orchards.

"Victoria, B.C., April 28.—Tent Caterpillars are hatching and are very numerous.—[R. M. Palmer.]

"Victoria, B.C., May 18.—Tent Caterpillars swarm everywhere, but as usual a large proportion bear the eggs of parasites (*Tachina*). I am sending you a specimen of the Caterpillar with no less than 8 eggs on it; from this you will see the abundance of the parasites."—[E. A. Carew-Gibson.]

The specimens represented in Mr. Carew-Gibson's sending were *Clisiocampa Californica* and *C. Americana.*

"Agassiz, B.C.—We have this year swarms of Forest Tent Caterpillars. The hazel, willow, crab apple, birch and alder in the woods, all seem to be infested."—[Thos. A. Sharpe.]

Fig. 7.—Forest Tent Caterpillar; eggs and moth.

Fig. 6 shows the Forest Tent Caterpillar and Fig. 7 the eggs (natural size and enlarged) and female moth of the same. All the Tent Caterpillars resemble each other very much and will be easily recognized from these cuts.

The remedies for Tent Caterpillars of all kinds are hand-picking of the eggs and young colonies and the spraying of the foliage of infested trees before the caterpillars get large enough to do much harm.

Canker-worms (*Anisopteryx*).—Two references only to injury by Canker-worms have been made this season; but I observed while travelling through Nova Scotia in June last the abundant presence of these insects in certain localities. I was much pleased to notice the general adoption of spraying by the leading fruit growers. These caterpillars must be treated while they are young, or the ordinary spraying mixtures are not strong enough to destroy them.

"Grimsby, May 31.—Mr. Laws has handed me a box of apple boughs cut from his father's orchard near Camden, Ont., where the Canker-worm is very bad. He says he has tried Paris green faithfully without effect. The orchard looks as if fire had been through it in summer."—[L. Woolverton.]

"Berwick, N.S.—The Canker-worm still crops up in some sections; an infected district takes a long time and careful work to clear up. I do not know of any serious losses this year from its ravages."—[S. C. Parker.]

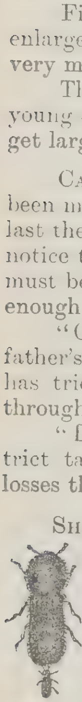


Fig. 8.—Shot-borer nat. size & enlarged.

Shot-borer (*Xyleborus dispar*, Fab.).—This injurious enemy of the apple continues to commit serious depredations in the orchards of Nova Scotia and Prince Edward Island, where it attacks both apple and plum trees. The most extensive injury brought to my notice during the past season occurred at Grand Pré, King's County, N.S., where Mr. George Johnson, the Dominion Statistician, found the beetles working much havoc in his own orchard as well as in those of several of his neighbours. The best remedy for this insect is the wash mentioned by Mr. John S. Woodworth, of Berwick, N. S., in my Report for 1894, viz., washing the trees liable to attack three times,—early and late in June and once in July, with the following: Soft soap, 1 gallon; water, 3 gallons; carbolic acid, ½ pint. This same mixture has been used successfully against the Peach Bark-borer (*Phlœotribus liminaris*, Harris).


Fig. 9.—Oyster-shell Bark-louse.

Oyster-shell Bark-louse (*Mytilaspis pomorum*, Bouché).—Every year brings numerous complaints of the deadly work of this enemy of the fruit grower, and 1897 has been pre-eminently a scale-insect year, owing to the anxiety about the San José scale having directed a more than usual amount of attention to these inconspicuous but frequently fatal enemies of fruit trees.

The best remedies for all scale-insects which, like the Oyster-shell Bark-louse, have only one brood in the year, is to spray the trees before the buds burst, and again in June when the young are moving, with the Riley-Hubbard kerosene emulsion (1 to 9), or with whale oil soap, 1 lb. in 2 gallons of water. In addition, —and this is of great importance,—a healthy,

vigorous growth should be induced by manuring liberally, frequent cultivation of the land, and judicious pruning of the trees. On this point Mr. S. C. Parker, the Secretary of the Nova Scotia Fruit Growers' Association, writes:—"I notice in your report for 1896 many complaints from Cape Breton, Prince Edward Island, etc., of the Oyster-shell Bark-louse. I would like to wager a trifle that in four out of five cases these orchards are in grass, perhaps a cow pasture. It is of little use to try to grow trees in Nova Scotia or Prince Edward Island without thorough cultivation and annual application of fertilizers. I have yet to see a healthy tree growing vigorously that will spend any time bothering with bark-lice."

The APPLE MAGGOT (*Trypeta pomonella*, Walsh), referred to in my last report as the cause of considerable injury in Dr. Young's orchard at Adolphustown, Lennox Co., Ont., has apparently not increased during the past season. Dr. Young writes: "September 27.—We have a few of the Apple Maggott in the fruits of the same trees as last year, but not nearly so many as there were then. We ploughed and cultivated the ground last fall, and once in the winter when there was quite a thaw, and then again gave it a deep ploughing in the spring."

Fig. 10.—Fly of Apple Maggot.

The Apple Maggot is extremely abundant in the state of Vermont close to the borders of the province of Quebec, and Mr. J. T. Macomber, of Grand Island, Vt., writes to me that "it occurs every year and is increasing fast; in some orchards more than 50 per cent of the fruit is ruined. Numbers of the maggots are found in each apple tunnelling all through the pulp and utterly ruining it, except for stock." Fruit growers in the Eastern Townships should be on the lookout for any such injury to apples as is shown on the cut of an infested apple given herewith, or for an insect resembling Fig. 10, which shows the fly enlarged. These flies will be found after midsummer. They are dark in colour, with yellowish head and legs, with clear white bands across the abdomen. They are not very active and may be looked for on the apple trees in late summer and autumn. The remedy which is most relied on is the prompt gathering and destruction of all windfalls before the maggots leave them to go into the ground. This can be done by keeping poultry, pigs, sheep or other stock in the orchard.

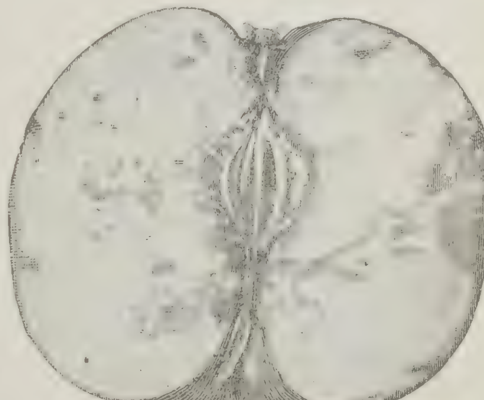


Fig. 11.—Apple infested by Apple Maggot.

The APPLE FRUIT MINER (*Argyresthia conjugella*, Z.).—Considerable space in my last report was devoted to a new enemy of the apple which in British Columbia caused last year great anxiety from the extent and serious nature of its injuries, which closely resemble those of the Apple Maggot. Last spring the perfect insect was successfully reared both

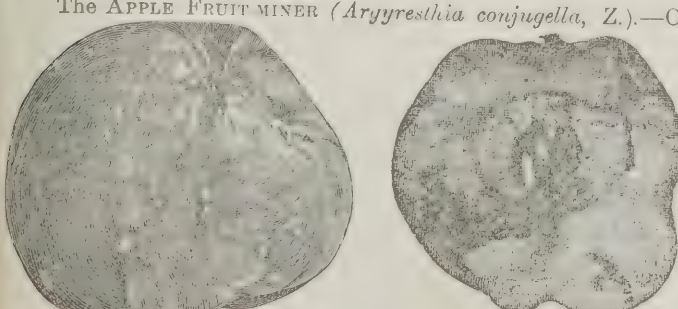


Fig. 12.—Apple injured by Apple-fruit Miner, and the same cut open.

by Mr. E. A. Carew-Gibson, in Victoria, B.C., and by myself at Ottawa. It proved to be a beautiful little Tineid moth belonging to the genus *Argyresthia*. One of the specimens was sent to Lord Walsingham, of Thetford, England, a high authority on Microlepidoptera, who reports as follows :—

"Merton Hall, Thetford, England, Dec. 13, 1897.—The moth which you have submitted for determination is *Argyresthia conjugella*, Z., which in Europe feeds in the fruit of *Pirus Aucuparia*, but has not been recorded, so far as we know, from *Pirus Malus*. Lord Walsingham has a worn specimen from Esquimalt, Vancouver Island, and he is inclined to think that his identification of the allied species *mendica*, Hw. (*Insect Life*, *III*, 118), as occurring at Washington, may have been erroneous, as the specimen was evidently not in good condition, and he would suggest that search should be made for the larvæ there and elsewhere."—[Jno. Hartley Durrant, Ent. Asst. to Lord Walsingham.]

The moth is a slender insect measuring $\frac{3}{8}$ inch across the expanded wings. Upper wings silvery gray, mottled with darker patches. Along the inner margin, from the base to the middle of the wing, is a broad silvery band of white ending abruptly on the inner margin but in a spur running backwards at the outer angle of the band. This is followed by a conspicuous black patch, which, widest at the inner margin, runs diagonally backwards across the wing ; next to this is an elongated triangular white patch mottled with brown, having the base on the inner margin of the wing and the apex elongated and directed backwards toward the tip of the wing, which terminates with an eye-like spot somewhat like a peacock's feather. The dark gray lower wings are heavily fringed all round with long silky gray hairs, as also is the lower apical margin of the upper wings. The frontal tuft and the thorax are of the same silvery white as the broad bands on the upper wings, which come together when the wings are closed and, joining with the thorax, form a continuous white dorsal stripe from the front to half way down the wings, where it is cut off by the dark bands which cross the wings diagonally. The two white triangular patches also come together when the wings are closed, forming a crescent-shaped saddle toward the tip of the wings. When at rest the posterior end of the body is raised up at an angle of 45 degrees and the insect is supported on four legs very widely separated. At such times the moth bears very little resemblance to an insect and may certainly be easily overlooked.

Mr. Carew-Gibson was the first to breed this moth ; one of his specimens which he kindly forwarded to me, emerged from the cocoon on May 20, and another a few days later. The single pair which I bred at Ottawa from apples collected at Agassiz, B.C., by Dr. William Saunders, emerged on June 2 and 3, the cocoon having been taken out of the cellar May 24. Although they were male and female, I failed to get them to pair ; thus no studies could be made of the eggs and the mode of oviposition. There has been little complaint of injury by the Apple Fruit-miner during the past season. Mr. R. M. Palmer, in a valuable report on the insect injuries of the year in British Columbia, with which he has favoured me, says :—"The Apple Fruit miner, as I expected, has been very little noticed this season, although I occasionally see specimens of apples injured by it ; so, it has not quite disappeared. The apple crop of the province this year has been an exceptionally good one, and the fruit better coloured and freer from scab than for many years past. The practice of spraying is now pretty general, and the season has also been favourable."

PLANT-LICE (*Aphididæ*) of all kinds and upon almost every crop cultivated have been particularly abundant during the past season in all parts of Canada except British Columbia, where, strangely enough as this province in most years suffers severely from them, there were less than usual :—

"Victoria, October 4.—Aphides of all kinds have been less numerous this summer than any year since I have been in the province. *Aphis brassicæ*, however, was an exception and was very troublesome on the islands."—[R. M. Palmer.]

"Yarmouth, N.S., November 30.—The excessive rains of April, May and the first half of June during which there was a precipitation of 18·8 inches were not propitious to insect life, except that we were visited by unprecedented swarms of Aphides that

covered all the young growth of fruit trees and were most destructive to the fruit crop. In some varieties of apples, the Gravenstein suffering most, the crop was utterly ruined, and in all it was greatly diminished. Young trees in the nursery were destroyed, or the growth for the year stopped."—[Charles E. Brown.]

"Sussex, King's Co., N.B., November 19.—On young apple trees the green aphis was in very large numbers, always with the attendant ants."—[W. W. Hubbard.]

Mr. Martin Burrell, of St. Catharines, Ont., has favoured me with the following useful observations on some Plant-lice of the orchard made by him during the past season :—

"As far as fruit-growing is concerned the different species of Plant-lice have been by far the most serious pests we have had this season. I do not recall such a scourge for many years. Every kind of fruit tree was affected, and even the weeds did not escape.

"The principal damage has been done by the Cherry Aphis (*Myzus cerasi*, Fab.), whose attacks on the sweet cherry of this peninsula were simply disastrous. I do not think I should be overshooting the mark if I said that half the crop was ruined. I saw many cases where not only the foliage was covered but even the fruit, and especially the stalks, with lice. The application of kerosene emulsion is such a "messy" business and the pressure of other work is so great at that season of the year that the pest is rarely checked on its first appearance. We shall have to din it thoroughly into our heads that the stamping out of the early generations of both the black and green aphis is the most important work of the day. The green species did an enormous amount of harm, not only to the growing shoots of young plum and pear trees, but to the foliage of the fruiting trees, thereby impairing both the size and flavour of the fruit and further depressing already congested markets by dumping on them large quantities of half-coloured, insipid and worthless plums. It is, of course, well known that the black species of lice are more resistant to insecticides than the green. I find that the kerosene emulsion should be diluted with only 6 or 7 times the quantity of water to be effective against *Myzus cerasi*, while 1 to 12 or 14 is all right for the green forms.

"Tobacco water should be on the strong side too. I did not find 1 pound to 6 gallons thoroughly effective. A closer proportion would, I think, be advisable, and the tobacco should be boiled thoroughly. The lady-birds did good work this year among the lice, as might be expected, especially *Coccinella 9-notata*, Hbst., and *Anatis 15-punctata*, Oliv. *Myzus cerasi*, which usually keeps pretty much to the sweet cherries, appeared in my orchard of Early Richmond cherries toward the end of June, and by July 1st was increasing very rapidly. During this time the larvæ of *Anatis 15-punctata* were doing good work on the lice. By July 4th most of the larvæ had pupated. The pupal period was only from 4 to 6 days, and by July 10th any quantities of the beetles could be seen, the predominant colour being a creamy white or even lavender, with the characteristic markings. The lice by this time had decidedly lessened in numbers and I felt that I could leave them safely in the hands of our coccinellid friends."—[Martin Burrell.]

The Plum Aphis (*Aphis prunifolii*, Fitch) has been unusually abundant in many parts of the Dominion, being the Plant-louse most often inquired about in correspondence. Reports of Plant-lice on plum from Manitoba, the North-west Territories and British Columbia probably referred to a different species, *Hyalopterus pruni*, Fab., which is also stated by Prof. C. P. Gillette in the Proceedings of the Ninth Annual Meeting of the Association of Economic Entomologists to have been particularly wide-spread and very injurious to plum trees in Colorado during the past summer."

"Woodville, Lot 2, P.E.I., June 10.—I send you specimens of an insect that has over-run our orchards of plums and Damsons. They cause the leaves to curl, dry up and die in a short time. Please let me know what they are and how to get rid of them."—[Michael McGrath.]

The specimens sent with this letter were *Aphis prunifolii*, Fitch.

"Nappan, Cumberland Co., N.S., July 8.—I send you specimens of *Aphis prunifolii*. These are a terrible pest on our plum trees. The kerosene emulsion is a sure cure if it

strikes the insect, but it seems almost impossible to get at the Plant-lice when they are on the underside of the leaves."—[W. S. Blair.]

Several specimens were also sent from different localities in Ontario. Mr. A. W. Donaldson found them very troublesome at Shakespeare, Oxford Co., Ont.

"Leamington, Essex Co., Ont., Nov. 24.—The most troublesome insects we had to contend with this season were Aphids on the plum and cherry trees. They were especially bad on the plum. I have never before seen them so numerous. They came in such numbers that we could do nothing with them. I sprayed, but after the leaves had curled it was hard to get at the insects. I had to make the emulsion as strong as we dared to use it ; otherwise it would not kill them."—[W. W. Hilborn.]

Remedies.—Many of my correspondents, while acknowledging the efficacy of kerosene emulsion as a remedy fatal to all Plant-lice, at the same time dislike using it on account of its odour and destructive effect on India-rubber hoses. Recent experiments have shown that good work can be done with some of the other washes usually recommended. Mr. R. M. Palmer, who has had a great deal of experience in treating the Apple Plant-louse and other species in British Columbia speaks very strongly in favour of the following tobacco and soap wash : "Soak 4 pounds waste tobacco in 9 gallons hot water for 4 or 5 hours (or in the same quantity of cold water for 4 or 5 days) ; dissolve 1 pound whale-oil soap in one gallon hot water ; strain the tobacco decoction in the dissolved soap, and apply the mixture to affected trees with a spray pump, using a fine nozzle and all the force possible."

Prof. Gillette, when speaking of the attack on plums in Colorado by Plant-lice, says :—"In our experiments whale-oil soap, in the proportion of 1 pound to 8 gallons of water has been more effectual than the ordinary kerosene emulsion in destroying the lice. The powdery excretion upon the surface of these lice interferes greatly with any successful treatment unless the application be made with much force."

The Bronze Apple-tree Weevil (*Magdalis ænescens*, Lec.).—Complaints have been received from time to time of injury from this weevil, the larvæ of which infest the bark of apple trees in British Columbia. Last summer a new attack was observed by Rev. G. W. Taylor on Gabriola Island, B.C., when the perfect beetles swarmed in myriads on cherry trees and devoured the foliage.

The Western Strawberry Crown-borer (*Tyloderma foveolatum*, Say).—Specimens of this British Columbian beetle were received from Vancouver Island last summer. References have been made occasionally to injuries to the strawberry plant in British Columbia by a crown-borer. As I had never found nor received from that province specimens of the ordinary Srawberry Crown-borer I was very anxious to secure specimens of this western pest, for identification. In June last I was pleased to receive specimens of the mature beetle, from Messrs. E. A. Carew-Gibson and R. M. Palmer of Victoria. These proved to be *Tyloderma foveolatum*, Say, which had not been previously recorded as a pest of cultivated crops. Mr. Carew Gibson writes "I am sending you some weevils from a strawberry patch which they have completely wiped out this spring ;" and Mr. Palmer writes on the same subject—"Thank you for the name of the strawberry weevil ; the specimens were sent to me from Cowichan, where they had entirely ruined a small strawberry bed."

The Currant Maggot, Currant Fly (*Epochra Canadensis*, Lœw.).—Another question which has been settled during the past summer, is the indentity of an insect which does an enormous amount of injury to Black Currants in British Columbia, the fruit being rendered quite unfit for use owing to the large numbers of maggots which infest it. I have for years endeavoured in vain to get specimens of the fly or infested fruit so as to breed the fly. I am now under obligation to Mr. Carew-Gibson, for an opportunity to examine some flies bred by him from these maggots.

"Victoria, May 21.—I am sending you some specimens of the flies hatched from my currant fruit worms, i.e., the insect which lives in the larval stage inside the fruit of the currant. Is this *Epochra Canadensis?* The flies hatched out yesterdy (May 20), and I now recognize them as a very common fly here at certain times." The flies received were well marked examples of *Epochra Canadensis*, Lœw., an insect which

notwithstanding its name *Canadensis*, I had never before seen in Canada, nor have I heard of its injuries in any other part of the Dominion than British Columbia.

In a very complete monograph upon this insect, published in 1896, by Prof. F. L. Harvey, of Maine, full details are given of the life history and habits. With the exception of British Columbia, this insect is certainly nowhere common in Canada, although like the Apple Maggot it is abundant in some seasons in the State of Maine close to our borders.

THE NATIVE CURRANT SAW-FLY. (*Gymnonychus appendiculatus*, Hartig).—This insect which was formerly called *Pristiphora grossulariæ*, Walsh, is by no means common in Canada, but last spring the larvæ did considerable damage on Vancouver Island. The Rev. G. W. Taylor wrote from Gabriola Island, B.C., on July 29 last :—"The saw-flies of the gooseberry and currant appeared early this season and practically spoiled the bushes for the year. A second brood appeared at the middle of June, but the larvæ were much less numerous." Several specimens of the mature insects were bred by Mr. Taylor and forwarded for examination. These were submitted to Mr. W. H. Harrington, who has made a special study of this class of insects and he has kindly provided me with the following report upon them :—

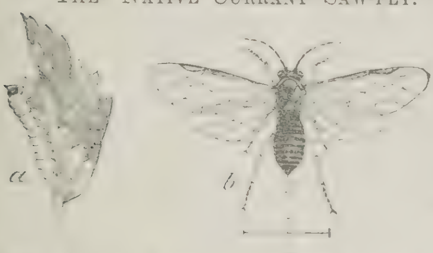


Fig. 13—The Native Currant Saw-fly—larva and adult.

"*Gymnonychus appendiculatus*, Hartig.—I have made a careful examination of the sawflies received by you from Rev. G. W. Taylor, and find them to be *Gymnonychus appendiculatus*, Hartig. On my first examination the insects were referred to the genus Pristiphora, and seemed to answer very closely to Norton's description of his *P. relativa*, the type of which was from Great Slave Lake, collected by R. Kennicott. On reference to Cameron (*Brit. Phytophagous Hymenoptera*, II., p. 66) the description of *Nematus appendiculatus* was found to apply very closely to the Vancouver Island specimens, and a microscopical examination of the claws shows that the species belongs to the new genus *Gymnonychus* erected by Marlatt (*Nematinæ of N. A.*, p. 122) for those species of Pristiphora having the claws entirely untoothed (*gumnos* = naked, and *onux* = a claw). The species, therefore, is now named as above cited and is the currant saw-fly named by Walsh as *P. grossulariæ*, and treated of under that name by Walsh, Packard, Glover, Riley, Saunders and other writers (see Marlatt, *loc. cit.*). Norton's *P. relativa* may possibly be identical.—[W. H. Harrington.]

THE SAN JOSÉ SCALE

(*Aspidiotus perniciosus*, Comstock).

"Well, how about this San José Scale we hear so much about?" is a trite question which has been very frequently put to the Entomologist during the past season.

Early in the present year undoubted specimens of the San José Scale were received for examination from orchards near Chatham, Kent Co., and from near Niagara, Lincoln Co., in western Ontario.

In 1894, in anticipation of the spread of this most injurious pest of the orchard from infested States to the south of us, and so that our fruit growers might be warned beforehand, articles were prepared and published in the report of this Division, the *Annual Report of the Entomological Society of Ontario* for the same year, and the *Farmers' Advocate* of London, Ont., an influential agricultural journal with an extensive

circulation. In these articles will be found a full account of the life history and development of the insect, characters by which it may be recognized, and what were at that time thought to be the best means of fighting against it. Ever since it became known certainly that this scourge had effected a footing in our orchards, great anxiety has been shown by fruit growers in all parts of the Dominion, to obtain reliable information about it. Numerous specimens of various kinds of insects, fungi, corky excretions on the bark, etc., have been sent in for examination. The importance of every one concerned being enabled to recognize this pest as soon as possible, so that prompt action might be taken to control it, suggested the advisability of issuing last summer a large wall poster which could be put up in conspicuous places such as post offices, railway stations, newspaper offices and public halls throughout the district, where the scale was likely to occur.

This poster (2 ft. 3 in. by 1 ft. 8 in.) was got up much in the same form as a similar poster issued by Prof. Webster, the State Entomologist of Ohio, on the same subject and gave the excellent illustrations prepared by direction of Dr. Howard, the United States Entomologist, showing an infested pear and a piece of a branch, also enlarged figures of the female insect and her scale. The object of this poster was to warn fruit growers that the scale was already in Canada and that if it were allowed to spread great loss would certainly result. The best way to recognize the pest was given, with advice as to the course to pursue, should it be discovered in an orchard.

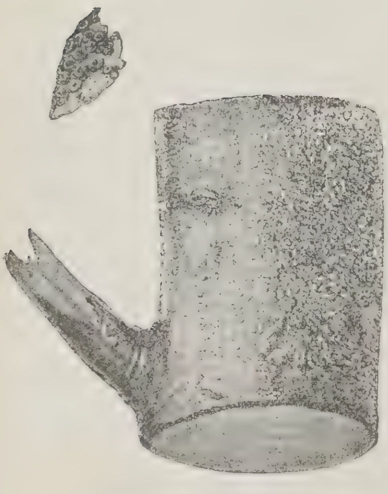


Fig. 14—Branch infested by San José Scale.

Fig. 15.—Pear infested by San José Scale.

A great deal has been written concerning the San José Scale since its unfortunate introduction into the East, and its detection as a serious enemy of fruits by Dr. Howard in August, 1893. This scale has been treated of at considerable length in previous reports of this division, and numerous articles in government publications are accessible to any one who wishes to inform himself on the subject.

For the purposes of this report, it seems more useful to give a concise account of the insect, its appearance, so that it may be recognized, its life history, occurrence in

Canada, and the most approved remedies so far tried; also to answer briefly some of the pertinent questions frequently asked by correspondents and others concerning it.

What is the San José Scale?—It is a very small (the largest specimens, not more than $\frac{1}{8}$-inch in diameter) round, flattened and inconspicuous scale-insect; that is, like the well known Oyster-shell Bark-louse and the Scurfy Bark-louse, a sucking insect covered by a waxy scale, which, as we find it on trees, is the only part visible, except in the early larval stage, when scale insects for a few days have the power of walking.

What it is not.—From the many different kinds of insects which have been sent in, it seems advisable to state that the San José Scale is not an easily seen insect resembling a beetle, a grub or a spider, nor has it well-developed wings and legs, but it is a minute creature which can only be detected by the closest examination, and even then requires some skill and experience to recognize it as an insect.

Among the objects which have been received under the supposition that they might be the San José Scale, were many things which in no way resembled scale-insects; but some, such as the small corky excrescences known as lenticels, which are found upon the young bark of some trees—apples, pears, birch, walnut, &c.—and certain minute fungi which are found on dead wood, do bear some resemblances to scale insects. Their different nature, however, may generally be easily detected by the fact that they cannot be detached from the bark without tearing the tissues, whereas all scale insects may be removed easily from the surface of plants by a gentle pressure.

How to know it.—The general appearance of the bark of infested trees is dirty, scurfy and grayish in colour, as though dusted with ashes. The scales usually are found in enormous numbers, frequently overlapping or occurring altogether on the top of other scales; they may be found throughout the summer of all sizes from the newly hatched mite-like larvæ to the fullgrown insects. In severe cases of infestation this massing of the scales produces a scurfy, dirty appearance of the bark, which when once seen is easily recognized. On young twigs, fruit and leaves, there is usually a well defined purplish ring surrounding each scale which is sometimes useful for detecting its presence when the scale itself might be overlooked; and although this purpling effect is produced by a few other scales, such as the Putnam Scale (*A. ancylus*, Put.) and the Forbes or Cherry Scale (*A. Forbesi*, Jnsn), it is particularly characteristic of the San José Scale, and even upon large branches, although invisible at the surface, may be found by cutting away some of the outer bark.

The scales of the males and females differ somewhat in shape.

Female:—Scale very thin, almost circular in outline, much flattened; size ranging from $\frac{1}{20}$ to $\frac{1}{8}$ of an inch in diameter; white at first, becoming grayish or blackish, particularly in the centre, and later much blackened by the fungus *Fumago salicina*, so common on trees attacked by many kinds of bark-lice and plant-lice. In the centre of the scale there is a small dark, or when the insect is dead or rubbed, yellow, nipple-like elevation surrounded by a distinct circular depression, which, as pointed out by Prof. Webster, is one of the best distinguishing marks between this scale and some closely allied species.

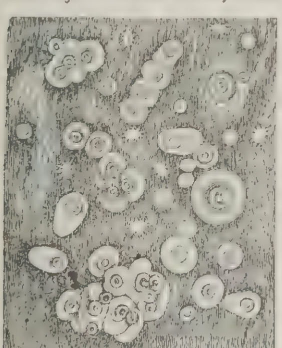


Fig. 16.—San José Scales, male and female—enlarged 6 diameters.

Male:—Scale about half the size of that of the female, rounded-oblong, with the nipple-like elevation plainly nearer to one end than the middle.

The drawing herewith shown was made by Dr. C. E. Saunders from a group of scales found upon a plum on 25th of July last. They are all, therefore, of the first brood of the season, although certainly some of them were born later than others. The first young of the year were reported from Niagara on 1st of July, so that the largest specimens would be about three weeks old. This was by Mr. Charles Thonger, a careful observer. Male insects almost ready to emerge from their scales, were found among the scales shown in the figure.

Fig. 17.—San José Scale, male—much enlarged. The natural size is shown by the line in the circle below the right wing.

Life History.—The winter is passed by the partially grown insects beneath their scales. With the return of warm weather the next spring, growth is resumed, and the males reach maturity a few days before the females. They are extremely small two-winged flies (Fig. 17) and when examined under a magnifying glass are found to have orange yellow bodies, iridescent dusky wings and black eyes. These minute creatures have no mouths, so can take no food; consequently after having fertilized the females they very soon die. The date when the females become full-grown and begin to produce young varies with locality and climate. In Arizona the young larvæ are recorded as appearing in March. At Washington it is by the middle of May; in New Jersey during the last days of May; in the state of New York, early in June. At Amherst, Mass., they were first noticed 12th June, and, as far as I can learn, in our Niagara district between the middle of June and 1st of July. Most careful observations have been made under direction of the United States Entomologist, by Mr. Theo. Pergande. The following condensed life-history is compiled chiefly from *United States Division of Entomology, Bulletin No. 3, N.S.*, in which Mr. Pergande's observations are recorded.

The adult female gives birth to living young, instead of laying eggs like most other scale insects. Ordinarily, as with the Oyster-shell Bark-louse, eggs laid beneath the scales, in the course of a longer or shorter time, hatch, and the young larvæ migrate to different parts of the plant; but in the case of the San José Scale living young are produced day and night for a period of nearly six weeks before the exhausted female perishes, and this at the rate of about nine or ten every twenty-four hours. After birth, the young larva remains motionless for a short time beneath the scale of the mother, it then forces its way out and runs over the plant, seeking a suitable place to settle. It is a microscopic creature, pale orange in colour with an oval body, six legs and two feelers. The long thread-like proboscis, with which it sucks the sap of the plant, is doubled on itself and lies in a groove of the body wall. After crawling about for a few hours, the larva settles down and works its bristle-like sucking tube through the bark and remains fixed, if it be a female, for life, and if a male, until fully developed, when it will have a few hours more active life, during which it can fly about.

The development of the scale begins even before the larva becomes fixed. The secretion of the scale starts in the form of very minute white waxy filaments, which spring from all parts of the body and rapidly become more numerous until, within two days, the insect is entirely concealed by a whitish shell or scale, which has a prominent central nipple. The scale is formed by the matting and melting together of the waxy filaments. As in the development of most insects, there are also with these scale-insects distinct periods of the larval life, divided by moults of the skin, and, in the case of the males, marked by important structural changes. The first moult takes place when the larva is twelve days old. Up to this time, the male and female scales are exactly similar in size, colour and shape; but after the moult the insects beneath the scales bear no resemblance to each other; the males are larger than the females and have large purple eyes; while the females have lost their eyes entirely. The legs and feelers have disappeared in both sexes. Eighteen days after birth the second moult occurs and the males change to the first pupal condition (pro-pupa). The male scales now assume an

elongated shape. The legs and feelers have appeared again, and there are now prominent wing pads extending along the sides of the body. About twenty days after birth the male insect changes to the true pupa, in which all the parts shown in the pro-pupa are much more developed, and a slender organ at the end of the body called the style has appeared. From four to six days later, or from twenty-four to twenty-six days after birth, the males mature and emerge by backing out from the rear ends of their scales; this is chiefly by night or in the evening.

The changes which have gone on beneath the female scale are less striking than those described above. After the first moult the body of the female is practically an almost circular, flattened sac, with indistinct segmentation and without any visible organs, except the long sucking bristle with which it draws up continuously the sap of the tree it is infesting. The female moults a second time about 20 days after birth, and the last segment now shows the important characters of the mature female, which are of so much service in the exact identification of the species. The segmentation of the body at this stage is quite distinct.

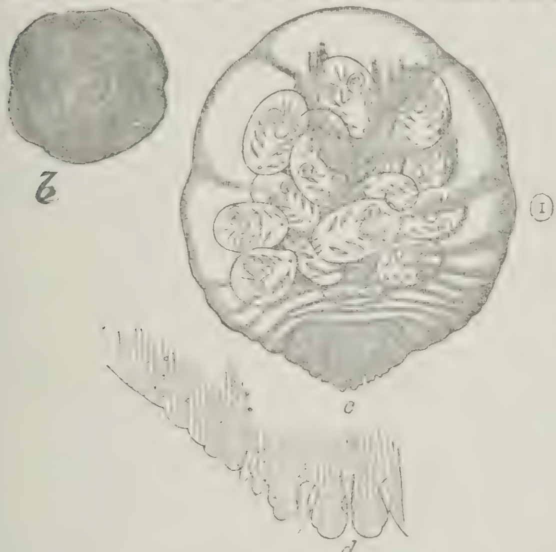


Fig. 18.—San José Scale.
(*b.*) Scale much enlarged. (*c.*) Female showing young, much enlarged. (*d.*) Anal lobes of female.

Thirty days from birth the females are full grown and the embryonic young may be seen within their bodies. The mature female, prior to the development of the young, is $\frac{1}{80}$ of an inch wide by $\frac{1}{25}$ of an inch long. The length of time necessary for the development of a generation varies somewhat; according to the Washington observations, it covers a period of from 33 to 40 days from the time a young larva appears until it develops into a mature female bearing young. The San José Scale is enormously prolific. It has been calculated that a single female may be the progenitor of 3,216 million descendants in a single season.

The exact identification of the species is of the greatest importance, for the San José Scale is now known to have many very bad characteristics not possessed by several other scales which resemble it very closely in appearance; and these make it a matter of public interest that no effort should be spared to control so dangerous a public enemy whenever it is detected in a new locality. The chief differences, in this connection, between the San José and some of these other scales are: (1) the fatal effects on the tree due to its greater rapidity of increase, and (2) certain minute but important structural characters which can be seen only with the help of a microscope.

The careful experiments at Washington, already alluded to, show that in one season from a single female an increase of 3,216 millions is possible. It is not, of course, to be expected that all of these would survive; but with the San José Scale there are many circumstances which make it less liable to diminution than many other insects. As a matter of fact, it is known that this scale does not spread from a new point of infestation with very great rapidity to contiguous trees, and also that, when once established upon a tree, it soon increases enormously in numbers—indeed, unless checked, usually spreading rapidly over the whole tree and destroying it. This rapid increase is characteristic of the species and is due, of course, to the great fecundity of the females. The fact that they bring forth their young alive throughout the season and that these are very quickly protected by a scale which is impervious to many liquids, affects very

seriously the question of remedies, making it necessary to apply several successive treatments, if it is hoped to thoroughly free a plant infested by this enemy so difficult to conquer.

The mere fact of a scale-insect occurring, even in vast numbers, upon a given plant does not necessarily prove that the species is a dangerous enemy to that kind of plant; for, although it may possibly be so and should be regarded with suspicion, this habit of occurring in great numbers on isolated trees, but on no others surrounding these, has frequently been noticed with scale-insects, and is probably due to some lack of vigour in the individual tree. In the case of the San José Scale, on the other hand, if other trees are reasonably near, it is almost certain that they will soon become infested; and, when a severe case of infestation is found, one of the first things looked for when considering whether the pest is actually the San José Scale or one of the other species which superficially resemble it very closely, is, whether surrounding trees are also infested.

This important difference of habit in spreading and the much more fatal effects upon trees from the presence of the San José Scale, make much more stringent measures necessary to secure its eradication than with many other species, even frequently rendering it advisable or imperative to destroy many trees, if not whole orchards. This being the case, the very great advantage is obvious of being perfectly sure as to the identity of an infesting scale-insect before valuable trees are condemned to destruction.

Unfortunately, as stated, there are several species of scale-insects which bear a very close superficial resemblance to the much to be dreaded San José Scale. On this point, which has been referred to by many entomologists, Mr. T. D. A Cockerell, a high authority, may be cited: "It has been a matter for dispute whether the San José Scale can be certainly recognized in the field. Its effect on the tree, killing the branches, is characteristic, but hardly in any sense diagnostic, while the reddening of the tissues of the plant adjacent to the scale is sometimes well marked with *A. ancylus*, as well as with *perniciosus*. A little experience, however, enables one to recognize the ashy gray, generally thickly massed scales of *perniciosus*, with the dot and ring of the male scale, as against the dark scale and contrasting reddish orange exuviæ of *ancylus*, or the similar scales of *ostreæformis* and *Forbesi*. At the same time, it is to be recommended that the diagnosis made in the field be in every case confirmed by examination of the insect under the compound microscope if either locality or plant is new." (*Technical Series, Bull. 6, U. S. Div. of Ent., 1897.*)

The above is from a valuable pamphlet prepared under Dr. Howard's direction for the special purpose of helping students to distinguish between these different scale-insects. Prof. F. M. Webster says: "I know of no insect the detection of which has given expert entomologists more trouble than this one. Its extreme minuteness, its close resemblance to the other species less harmful, and the frequency with which it is found concealed in cavities and about the wrinkles of the bark or under buds, render its detection, when present in limited numbers, a matter of extreme difficulty." (*Ohio Bulletin 81*, p. 183.)

For the exact separation of these closely allied species it is necessary to take the females from beneath the scales and examine them under a microscope after special preparation. The differences are then readily seen, but these are beyond the power of ordinary pocket lenses or magnifying glasses, and require compound microscopes, which are expensive instruments not in the hands of ordinary fruit growers, and for the use of which special knowledge is needed.

As, therefore, there are several kinds of scale-insects resembling each other so closely at first sight as to make it necessary for even expert entomologists to examine them with a microscope before being positive as to the identity, and as one of these, to wit the San José Scale, is extremely injurious and the others not nearly so much so, we invite all fruit growers to send for examination and report specimens of any suspicious scale-insects which they may find upon their trees before they adopt extreme measures or even decide upon what measures they will take to free their orchards. Not only does the San José Scale spread more rapidly than many other species, but it has been found much more resistant than others, to the ordinary applications used for scale-insects.

Food Plants.—The list of plants upon which the San José Scale has been found as a serious enemy is a very large one and may almost be said to include all deciduous trees and shrubs, and it has also been found in Maryland by Prof. W. G. Johnson, upon such unlikely plants as milk-weed (*Asclepias*) and crabgrass (*Panicum*). It is particularly noted, however, that the San José Scale does not attack Conifers—pines, spruces, cedars, &c.—and has not so far infested injuriously any of the citrus fruits, such as oranges, lemons, &c., although it has been found on these trees, and in the case of one species *Citrus trifoliata* was found in large numbers in New Jersey by Prof. J. B. Smith.

The botanical order to which most of the food plants belong is the Rose family. So far, I have seen specimens of this scale in Canada, upon the following trees: pear, plum, peach, black currant, apricot, apple, Russian mulberry and Japanese walnut.

So far as we know, the Forbes Scale has similar food habits, but Prof. Cockerell says that *A. ancylus*, the Putnam Scale, differs somewhat. This last is especially a maple species but will flourish on poplar, oak, etc. It does not seem to take very kindly to fruit trees as a general rule. It also does well (probably best) in the Transition faunal zone, whereas the San José Scale belongs to the more southerly Upper Austral. In Canada both the Putnam Scale and the Forbes Scale have been found on plum, pear, apple and cherry trees.

"The manner of attack is different, more or less, in the various species under discussion. *A. ancylus*, on fruit trees, will be found upon the smaller branches, but in my experience more or less scattered, rarely in any great quantity. *A. perniciosus* is found largely upon the branches, becoming very abundant, covering and killing them. On the young shoots the reddening effect is very marked, though *ancylus* will also produce reddening. *A. Forbesi*, as seen on apple trees in Mesilla (N. Mex.), occurs largely under loose bark on the trunk, wintering there in numbers, and only invades the branches in limited quantity. Thus there may be quite a lot of *Forbesi* on a tree without its being noticed."—(T. D. A. Cockerell, *Technical Series, Bull. 6, U.S. Div. of Ent., 1897.*)

"At first glance it is not easy to distinguish this species (*A. Forbesi*, the Forbes Scale), popularly known as the Cherry Scale, from the San José Scale. The purplish tinge of the bark is also quite conspicuous on some varieties of apple and pear where the Cherry Scale has established itself. The general appearance of the last segment of the female very closely resembles that of the San José Scale; but it can readily be distinguished from that species by the presence of spinnerets."—(Willis G. Johnson, *Proc. 9th Ann. Meeting, Ass'n Econ. Ent., 1897.*)

Means of Distribution.—It is thought probable that most scale-insects are distributed while in the minute larval form, chiefly by means of larger insects and of birds. Since the San José Scale has been so critically studied, this has been actually proved to be the case with that species, the young larvæ having been frequently observed crawling upon lady-bird beetles of several kinds, ants, and other insects which resort to the trees during the breeding season. Isolated colonies of scale-insects in the tops of otherwise uninfested trees and in close vicinity to the nests of small birds have doubtless originated in this way. It is stated that the larvæ are also carried by the wind; this seems difficult to understand, but has been proved by Mr. W. G. Johnson in Maryland. This insect may also undoubtedly be distributed by means of farm implements, domestic animals and workmen attending to orchards.

Much has been said about the danger of distributing the San José Scale through the sale of infested fruit; but, after considering the matter very carefully, I must still differ in opinion from many good entomologists who think that there is great danger from this cause. Fruit badly infested by the scale is generally disfigured too much to be marketed, and upon fruit which is not sufficiently injured to be condemned for the market the chances of the scale-insects surviving a long journey after the fruit is removed from the tree, packed and shipped, and then of its being peeled and the peelings thrown out in an orchard or near enough to a tree for the young larvæ to infest it, are so slight that I cannot even see the necessity of considering this danger. Further, I have failed to hear of a single instance where infestation could be attributed to such a cause, but it would, of course, be well, should any one detect the scale upon imported fruit, to be careful to burn all peelings and not throw them out in a yard or garden

where, in the event of any of the insects being alive and breeding, the young might be carried on to surrounding trees by flies or other insects attracted to the peelings during the short time that they were still moist.

Fatal effects of Infestation.—It has been noted by all observers that plants attacked by the San José Scale die with greater rapidity than from the attacks of other insects. "In the whole category of injurious insects we have not another one that is so difficult to detect, so pernicious in its effects and which breeds so rapidly as the San José Scale." —[F. M. Webster, Wooster, Ohio.]

"If the tree survives the attack, the infested wood becomes knotty and irregular, partly from the sapping of the juices by the insect and also without doubt largely from the poisoning of the sap of the cambium layer by the punctures of the insect, as indicated by the coloration. Young peach trees will ordinarily survive the scale only two of three years. Pears are sometimes killed outright, but generally maintain a feeble, sickly, existence, making little or no growth for a somewhat longer period."—(Howard & Marlatt, *Bull. 3.*)

Whether from the fact that the climate of Canada is not so well suited to the rapid increase of this scale as the warmer regions to the south of us, or from some other cause, it would appear to take a longer time in Canada for the San José Scale to produce fatal effects upon infested trees than stated above, and I only mention this as it has been several times referred to by correspondents when discussing whether or not the scale insect which has been found in Canadian orchards is really the San José Scale. Unfortunately, there is not the slightest doubt about this, and disastrous results have already attended its presence in Canadian orchards. To the credit of those fruit growers on whose grounds this scourge has been detected, it may be said that they have endeavoured to stamp out the occurrence promptly, sometimes at what seemed to those who did not understand the gravity of the case, to be a considerable and unnecessary sacrifice. The danger of heavy pecuniary losses in the various kinds of fruit trees, as well as in shade trees and ornamental shrubs, should the San José Scale be allowed to spread in Canada, must not be lost sight of, as there is hardly a deciduous shrub or tree which it will not infest. Now is the time to put forth great efforts to eradicate the pest wherever it may be found. The Federal Government and the Provincial Governments of Ontario and British Columbia are using every effort to learn of any occurrences in the country, and fruit growers will be suicidally foolish if they adopt the narrow-minded policy of trying to hide the fact if they have been so unfortunate as to accidentally introduce the pest into their orchards. A single tree neglected may be the means of infesting a whole orchard, from which the trees in every other orchard, garden, public park or cemetery in the neighbourhood may suffer irreparable injury.

Occurence in Canada.—The San José Scale is now known to occur in injurious numbers in a few Canadian orchards. These are situated in the fertile peach districts of the province of Ontario. The most western points in Ontario where infested orchards have been found are near Kingsville, Essex County, and Chatham, Kent County; others occur in the neighbourhood of Niagara and St. Catharines, probably the orchard worst infested being actually within the limits of the last named town.

In British Columbia there have been four distinct occurrences, all of which have been promptly eradicated through the energy of the active Inspector of Fruit Pests, Mr. R. M. Palmer, who saw that every infested tree and those immediately surrounding them were cut down and burnt as soon as the scale was detected. The localities where the San José Scale was found were at Kelowna, on the shore of Okanagan Lake, in 1894, at Victoria in 1896, and at Salt Spring Island and Nanaimo, on Vancouver Island, during the past summer.

The first occurrence of the San José Scale in Ontario, as far as I can learn, was on the grounds of Mr. John Van Horn, of Chatham, Ontario. This gentleman has made every effort to eradicate the pest and has kindly kept me posted during the season on the progress he was making against the scale. I have been similarly favoured with regard to the Niagara outbreaks by Mr. Charles Thonger, of Niagara, a practical and successful fruit grower and an accurate observer, moreover, possessed of the most remarkable eyesight for detecting San José Scale or any other injurious insect, also by

Mr. Martin Burrell, of St. Catharines, a trained observer and a practical fruit grower, who has studied injurious insects for many years, one, therefore, who was well calculated to observe and record any matters of value bearing upon the presence and increase of the San José Scale and the general condition of any orchards visited. All of these gentlemen, as well as Mr. M. G. Bruner, of Olinda, Essex Co., Ontario, who has observed carefully since its discovery the occurrence of the San José Scale in the orchard of Mr. John D. Wigle, at Kingsville, have favoured me with voluminous notes upon this important subject during the summer, and, as their experience and notes, both as to means by which orchards have become infested and the effect of measures adopted to control the spread of the San José Scale, are of general interest, I give herewith lengthy extracts from their letters.

Mr. Van Horn's letters:

"Chatham, Kent County, Ont., Jan. 12, 1897.—I have, unfortunately, got San José Scale on a lot of fine young plum trees. I am preparing to dose them with the California mixture mentioned in your report of 1894."

"Jan. 19.—I send you cuttings of Simoni plum and Lombard plum covered with what I think is San José Scale. Kindly give me all information at hand."

"Feb. 11.—Yours of the 9th received with thanks. Two years ago this spring I ordered a lot of plum trees from Parry's 'Pomona' Nurseries, New Jersey. Among the lot was one dozen Simoni plum trees—a fine lot of well grown and handsome trees. After putting out, they all grew finely; all made vigorous growth in spite of a very dry summer. During the summer I received a circular from the nurserymen saying that San José Scale had got into their trees, imported from California, and stating that no further danger need be feared, as they were disinfecting all stock after discovering the pest. I paid no more attention to it, as my trees were doing so well. I did not notice anything wrong till this winter, and one day while going through them I noticed four of the Simoni looking sick, the bark looking as if dusted with ashes. As the disease was new to me I sent samples to them, as well as to you. They (Parry's) like yourself, answered that it was the dreaded scale all right, and recommended digging out and burning if badly affected, and if but slightly, to wash with whale-oil soap. I cut off two trees near the ground, intending to drench the stumps and let the trees sprout again from the roots. Those only slightly affected, I cut back severely and have sprayed with the salt, sulphur and lime mixture and will go over them again shortly with the same, and then later on will give them a dose of whale-oil soap suds.

"The trees were ordered direct from the nursery and not by agents, so there may be no more in this part of the country. I have examined a number of my neighbours' orchards, but can find no trace of the scale. I am very anxious to wipe it out, so that it may not spread to my neighbours' orchards, as well as the rest of my own. If I thought it necessary, I would dig up and burn all infested trees, but with your kind assistance by way of advice, I would be delighted to master it otherwise. I am very fond of fruit growing and dislike very much to be beaten by such things as San José Scale or any other pest and will conquer it if I can."

"April 8.—I got the trees from Parry's nurseries. I gave my son-in-law, who lives a few miles from me, a nice Simoni tree. I did not see the tree again till last week, when I was helping him trim his trees. On coming to his Simoni, which he was very proud of, as it had grown so much last summer, I said, 'You had better get your spade and dig it up at once,' for it was crusted all over with scale. I took my magnifying glass and let him see for himself. I did not loose sight of the tree till it was in the fire. I could see no signs of the scale on his other trees, and I hope they are not infested."—[J. Van Horn.]

At the end of the season Mr. Van Horn wrote to me that he believed his orchard was quite clear of the scale. During the month of December, 1897, I visited his orchard and examined the trees very carefully. I found the following state of affairs. Of the two trees which were badly infested, one had been dug up and destroyed entirely, the other was cut off last winter within a few inches from the ground and thoroughly drenched with the "lime, sulphur and salt" mixture and subsequently with the whale-oil soap solution. This stump had thrown up during the summer some vigorous

young shoots upon which no trace of the scale could be found, although on the old stump many of the scales which had been killed by the treatment given them last winter were still discernible. Besides these two badly infested trees, those which were slightly affected and had been severely cut back last winter and then treated, had made vigorous growth. Upon some of these a very few living scales were found, showing that, although the treatment with whale-oil soap was extremely effective, rendering it possible to find the scales only by very close search, yet it was not absolutely so, as there were a few still alive. Mr. Van Horn had attended to this matter very carefully, being much interested in it and being also keenly solicitous for the welfare of his neighbours. Every tree in his orchard had been sprayed, and he intends to repeat the operation regularly during the coming season.

Mr. Thonger's letters :

"Niagara, May 10.—I have discovered San José Scale on several of my trees, but do not think it is in any other orchard in the neighbourhood as yet, as nobody seems to know anything about it. I have dug out several dwarf trees—the worst—and sprayed with whale-oil soap solution all those immediately surrounding the infested spot. That was on Thursday last, and I thought these looked cleaner a day or two after, and I almost regretted that I cut down the others ; but this may be fancy. I feel considerable responsibility in the matter and shall be glad of any information you can give me."

"May 11.—I send you to-day some infested twigs (pear tree). I have selected them with the object of showing the difficulty of detecting the scale when only a few are present, rather than the extreme stages, when, the whole trunk being covered with a mass of scales that hide the bark, it is obvious enough.

"I noticed only one tree last summer and was struck by its disgusting appearance. This tree was planted eight years this spring. Including this tree, I have taken out to burn seven trees as too badly infested to cure, and left about as many nearly as bad, to spray. The infested stock must have been from F. C. Young, Rochester, N.Y., and planted in May, 1894 ; or perhaps with a replace not later than 1895. This would indicate that the scale may spread one or two seasons without being observed, or even longer, or migrate from the infested stock and develop quicker in the new location. The infestation is evidently very slow in developing to such an extent as to attract attention, unless it happens to strike a pear tree or one as favourable to its growth and development. The scale appears to have started in the south-west corner of a plot and spread north and east to some 50 trees. I must spray the whole plot, and will try and keep you informed of my progress.

"My farm is well situated for isolating the attack. On the lake shore there is nothing to take the infestation to the north-east or west,—I think the wind has much to do with spreading it—and the infested area is well sheltered by woods from all quarters but south-west to south-east. I think it would be quite to the interest of the fruit growers of this country if the Department of Agriculture would send an expert here to examine into the matter on the spot, and decide what is the best thing to do and to assist in carrying it out.

"It is clearly of the utmost importance to prevent the scale from getting a foothold in the country. The Black Knot experience shows that the individual growers will not take the pains to eradicate a pest that does not kill the tree at once, but this sort of action will not do in this case. Rather than assume the responsibility, as well as the cost, of attempting to fight the pest myself, I would rather cut down and burn every infested tree ; but I do not think that course would be in the best interest of either the country or myself."

"May 27.—I have been making a tree-to-tree examination through the orchard, taking row by row and have found two peach trees much farther away from the pear trees than the dead tree of which I sent you samples. The nearer tree is one about ten years old. I think the confidence we have had in the precautions to keep the scale out of the country is largely to blame for the hold it has now among us. I cannot look at this tree without the conviction that, had I even glanced at it three years ago with scale in my eye, it must have been detected at once. Even last summer, when seen on the pear tree, I was quite unsuspicious, and only when two men who have been among fruit

trees all their lives said they had never seen it before, did I think it must be the dreaded scale.

"The most remarkable thing I observe among the peach trees is the limited area to which this scale is confined. An infested tree will have one or two limbs affected, and the others, perhaps, quite free, with only a few scales scattered about the base of last year's laterals. On the trees immediately surrounding the infested one, perhaps only a scale or two can be found, or in some instances a few small groups of six or eight. I marked the spots with red lead as I came to each tree, and on trees considered centres of infestation I drew two rings round the trunk; the others with few scales, or even one only, I marked with red spots. There is no danger of losing them and I shall know just what spraying to give when I get the material. I recognize about three centres of infestation among the peach trees, and some 50 trees that should be thoroughly sprayed, over and above the pear trees."

"July 5.—I first noticed the young on Saturday, 3rd inst., and by Monday noon they were quite plentiful on the trunks of infested trees and even a few on the fruit of the pears. They are extremely minute, nearly globular in form and, as far as I could see with a magnifying glass, without any vestige of legs or head; the colour, a light yellow verging to white. The characteristic stain is quite marked on the fruit and makes the nature of the minute spot distinct. The scale is more abundant than might be expected, even on pear trees painted with a 2 pound to the gallon whale-oil soap solution."

"July 21.—The samples I send you are from a tree treated three times with soap spray (the last time of 1 pound of soap to 5 gallons of water), and once with kerosene emulsion strong enough to nearly strip some of my peach trees of leaves. The young scale comes out freely on to the new pear wood and fruit, but I have only seen one young scale on a new peach shoot; perhaps later in the season they may work out. Probably the fuzz on the peach would protect the fruit from the inroads of the scale, so that fruit from an infested peach tree would have little, if any, effect in spreading the pest.

"It looks as if painting the trees with a 2 pound to the gallon soap solution had but little effect on the old scale. In places where they are thick I can squeeze out quite large insects."

"November 27.—I have not myself seen any more cases of infestation than my own, but a man who has been cutting back in my infested trees the last month or so and who knows the appearance of the scale well, tells me that two or three days ago he had found numerous adult scales and young on trees in his village lot, and that his neighbours have several trees as badly covered with scale as any of mine, and also a considerable quantity on another adjoining orchard of several acres, the grower of which talks of cutting out 8 rows so as to reduce the area of infestation to dimensions which he thinks he might treat with some prospect of disinfecting them.

"From the time the first brood of lice came out till September 9, I sprayed my infested pear trees with the whale-oil soap solution (1 pound to 5 gallons of water) once a week. I think it had very little, if any, effect in checking the increase of the scale on those trees, for all those slightly infested in the spring were almost covered as badly as the few I had taken out at the beginning of the season. I have since taken out and burned all the pear trees, dwarf and standard, in the small orchard that you saw near the house. Some of the trees at the north end were not affected and were doing well, but blight as well having got hold of many I did not think it worth the risk and trouble of further treatment. I intend to concentrate all my efforts on the peach trees. I am cutting them back (especially those infested) as far as I think the tree will bear, not to kill it, and hope to do something to keep the scale in check. I have very little hope whatever of getting rid of it entirely. I find infested trees through an area quite eight times as large as was infested in the spring, chiefly on trees three and four years old. These are easier to examine than those larger, but it indicates that quite half of the orchard should be treated to have even a chance of not missing any. I am considering now either to spray the whole orchard next year with kerosene and water, say from the end of April till the leaves or blossoms come out, in hopes of keeping the infes-

tation down and raising a crop; or with a scalding spray of either soap solution or pure water; but either course involves considerable outlay.

"I am really thoroughly disheartened in the matter, being convinced that we have either to destroy the infestation absolutely at once or be ruined by the expense of keeping it so far under control as not to destroy the trees or crop. It is just one of those things like a house on fire in a town, the whole force of those interested should at the beginning have been concentrated on the infested spots to smother it out.

"You ask, July 26, to note what distance young scales travel from the mother. In the summer I saw on pear shoots 18 or 20 inches long, young scales of the first brood only three or four leaves away from the extreme ends of the shoots. These were few in number, but the mother scale could not have been closer than the terminal bud of last year's growth, and most likely not as far out as that. This year, on Nov. 10, thermometer 55 degrees, cloudy day, I saw young lice crawling about. The first brood of the year did not come out till the first week of July, with a temperature of about 85 degrees in the shade.

"The man who told me he found scale three days ago said there were lots of young lice, and he thought he saw them move. The day was rather warm, south wind and about 60 in the shade."—[Chas. Thonger.]

Referring to Mr. Thonger's suggestion to spray with a scalding hot spray. I have found the application of hot spraying mixtures in the first place impossible, because the breaking up of the liquid into a spray causes it to cool before it has reached a distance of one or two feet from the nozzle, and, besides this, all hot water remedies are both extremely inconvenient to use and to make, and also very destructive to apparatus.

I have not had an opportunity of visiting this orchard myself this autumn; but I know Mr. Thonger to be a close observer, and he has reported to me from time to time on the progress made. Mr. Burrell has also visited this and some other infested orchards in the neighbourhood of St. Catharines, and his report appears herewith. I have been lately shown a letter published by Mr. Thonger in the *Rural New Yorker*, in which he speaks of treating his infested trees mechanically with a wire brush to free them of the scale. Although undoubtedly by this method a large number would be destroyed, still, this being an imperfect method, as many scales must necessarily escape the brush, I fear that it would be a dangerous practice to adopt, owing to the feeling of false security which would be created from the apparent cleanness of the trees. They might seem to be quite free from scale, but it would be impossible to treat the scales on the branches and small twigs with such a brush, and, judging from experience in other matters, I am confident that, although Mr. Thonger might follow up the brushing of the trunks with a thorough spraying of coal oil emulsion or of whale-oil soap solution, many others would not do so owing to the extra amount of labour and time necessary for two operations.

Mr. Martin Burrell's observations:

"St. Catharines, Ont., Oct. 11.—With reference to your inquiry as to the San José Scale, its spread, development, &c., I am very happy to give the results of my own observations in this district. In the two orchards where the scale is at work, there has certainly been an extension of the infested area since spring. The infestation of new trees has, however, not been nearly so marked as the extraordinary increase of the scale on trees that were only moderately attacked in the spring. In the latter case the scale has, in nearly every instance, spread over the whole tree, including leaves and fruit. On one three year old Japanese plum tree which was affected severely last year only on the trunk and the bases of the main limbs, the insects had spread to such an extent by the middle of July that out of 407 plums on one tree, 405 were attacked. One plum had on its surface upwards of 450 newly set scales, and in more than one case there were between 1,500 and 2,000 scales on a single leaf. When the breeding process is in full swing, the trees appear to have been dusted with a yellow powder. So minute and in such numbers are the insects, that on a raised piece of bark no bigger than a pea I have carefully estimated that there were more than 150 larvæ. It has been stated by some that the larvæ are not very active and move but an inch or so from the parent scale. The facts I have mentioned rather contradict this. It is true that, as far as my observations go, the larvæ do usually set within a short distance of the old scale, but,

for such an extremely small insect, it can travel fairly fast. I have timed them, when nearly an inch per minute was covered. As a matter of fact, I have found newly set scales 13 inches from the mother insect, and I see no reason why in many cases the distance should not be much greater. One can readily see, therefore, how rapid would be the spread among nursery stock. In stating that the spread, as far as new trees were concerned, was not very marked, it must, of course, be borne in mind how difficult it is—indeed almost impossible—to detect a fresh case where a few isolated scales only are on the tree. Quite recently I saw an English Damson tree some eight years old with one of the upper branches slightly atttacked, the fruit also showing scale. This tree was not contiguous to any infested trees, nor were the scales present on the trunk or lower limbs. The scale had evidently been carried by birds or other insects. This sort of thing may exist undetected in many instances, and the following season witness the usual rapid spread of the pest on all such trees. In a favourable season it is probable that four broods would occur in this latitude. They probably commenced breeding here about the middle of June, and although the cold weather of the last day or two has checked any activity on the part of the larvæ, there are any quantity of them so recently hatched as not yet to have developed the waxy scale. Only this morning I took 15 young ones in various stages of development from the body of one female. Taking June 15 as the date of the first brood's appearance, and assuming 39 days as the time for one generation (in the breeding case here, the time occupied was from 36 to 39 days) the fourth brood would commence emerging on October 10 and under favourable autumn conditions doubtless many of this last brood would develop sufficiently to winter over as half-grown females. I have watched carefully for any sign of the little lady-bird *(Pentilia misella)* which has done such good work on the San José Scale in California and even in the Eastern States, but have failed to see a single specimen. The Twice-stabbed Lady-bird *(Chilocorus bivulnerus)* I have found on infested trees, both in the larval and adult forms, but not in sufficient numbers to render it of any economic importance this season. The food plants upon which I have seen scale in this district are: the pear, the peach, the plum (both of the domestic and Japanese types) and the red currant.

"In conclusion, I may express my belief that the scale is liable to be a serious menace to Canadian horticulture, unless the most stringent measures are adopted to stamp it out of the few orchards where it exists, and the strongest precautions taken to prevent the sale and the planting of infested nursery stock.

"November 20.—I send a few additional notes on the orchard infested by San José Scale near here :—

First saw the trees on July 3. Breeding had probably been going on for some time prior to this ; scales of all ages were found and the larvæ were commencing to set on the young fruit.

July 10.—By this date some of the plums and many of the leaves were almost covered with scales.

July 26.—Some of the badly infested leaves dropping, and fruit and leaves showing marked red discoloration.

October 9.—Frost enough to shrivel a large proportion of the grape foliage.

October 13.—Warm and sunny. Breeding very active. Found from 20 to 30 *Pentilia misella* beetles on one badly infested tree, and over 50 on another. First time of observing these beetles. One *Pentilia* larva also apparently full grown.

Sprayed one badly infested tree with pure kerosene—a good soaking.

October 17.—Hard frost, quarter of an inch of ice.

October 18.—Breeding still active. Sprayed tree, apparently uninjured. Cut bark from four different parts of the tree, and a microscopic examination showed that every scale was dead.

October 28.—Breeding still going on. *Pentilia* beetles and *Chilocorus bivulnerus* both seen. (Have never found more than three or four of the latter on any one tree.)

November 19.—Cold and wet lately. No larvæ moving and no beetles.

"Now about the spread. These Abundance trees were planted in the spring of 1895. I should infer that at time of planting ten trees were infested, because there were just

ten trees in July the trunks of which were covered with scale. There are 40 or 50 of these Abundance trees together, and next to them on one side is a row of young Beurré D'Anjou pears, and on the other Lombard plums. I have pretty carefully examined the rows of Abundance and these two adjacent rows, and this is what I find at this date, November 19:

60 infested trees (out of a total of 78 in the block) composed as follows:—

10 infested in 1895, now covered and very sickly;

4 less severely, probably attacked last summer or early this spring;

46 slightly, varying from a slight scattering over of the tree to a few scales on a single limb. Every one of the young pear trees is infested slightly, and nine out of the 13 trees in the row the other side of the Abundance block. I have not had time to examine all the trees in the orchard (some 300 or so), but a walk through and a hasty look round revealed one or two trees slightly infested, and I have no doubt a thorough examination would bring to light a good many more cases The spread, therefore, has been very extensive this year."—[Martin Burrell.]

The Kingsville occurrence of the San José Scale was first reported to me by Mr. Milton G. Bruner, who also kindly showed me, in company with the owner, M. John D. Wigle, the infested spots in the orchards. Mr. Wigle has probably 6,000 trees and there are three centres of infestation, the scale occurring in different orchards, but all comparatively close together. As far as I could judge from a two hours' examination upon an extremely cold day, I should say that there were altogether about 300 trees infested more or less, most of them plum trees, the remainder being dwarf pears. Mr. Wigle is much exercised in this matter and has expressed himself as willing to do anything in his power to prevent the insect from spreading. My thanks are due to him and to Mr. Bruner for assistance in examining his orchards and also for facilities afforded for meeting the fruit growers of Essex County. While with these gentlemen, I had an opportunity of holding two meetings at Olinda and one at Kingsville. These meetings were well attended by leading fruit growers, and the matter of the San José Scale was thoroughly discussed. Mr. Bruner I found had made himself well acquainted with the subject and was able to recognize the species as well as was possible from a superficial examination. He had given much valuable information to those with whom he had been brought in contract in his official capacity as Township Inspector of Black Knot and other orchard pests.

REMEDIES.—The remedies other than total destruction of the trees which have been most successfully used towards checking injury by the San José Scale are: (1) Spraying with kerosene emulsion or pure coal oil; (2) washing with whale-oil soap; (3) fumigating with hydrocyanic acid gas; and (4) spraying with the lime-sulphur-and-salt mixture.

When a tree is found to be badly infested, save under very exceptional circumstances, the cheapest plan will be to cut it down at once and burn it. If, however, a tree is only slightly infested or there are special reasons for trying to save it, the tree should be pruned back as closely as it will stand and then washed thoroughly two or three times with whale-oil soap—two pounds of soap in one gallon of water. This is an expensive treatment, but on the whole is the most effective yet discovered.

1. *Kerosene.*—Prof. John B. Smith, of New Brunswick, N.J., Mr. C. L. Marlatt of Washington, D.C., and some other experimenters, have found that a light spraying of pure kerosene oil may be applied to trees without injury, if it be done sparingly, so as only just to cover the bark, and upon a bright day, when the oil will evaporate quickly. I must acknowledge that some limited experiments of my own have not been quite satisfactory. Professor Smith's experiments, however, have been very satisfactory to him, and on 1st of September last, he publicly recommended fruit growers to "spray thoroughly in September all infested bearing apple, pear, plum and peach trees with undiluted kerosene during the middle of a clear sunshiny day. By undiluted kerosene is meant the ordinary burning fluid used in lamps, in exactly the condition in which it is purchased. It should be applied in the finest possible spray, and every part of the plant should be thoroughly wet, but no more."

At the last meeting of the Association of Economic Entomologists held at Detroit, August 12-15, 1897, Mr. Marlatt read some "Notes on Insecticides," in which he speaks

of some experiments in treating several kinds of trees early last spring with pure kerosene. His report is as follows: "Much to my astonishment, no ill effects of any moment resulted in the case of any of the trees sprayed with kerosene. In the case of all the trees, spraying was continued just long enough to moisten the plants thoroughly, but not to cause the oil to run down the trunks and collect about the base, and, with the young trees, the soil was carefully mounded up and pressed about the crown to avoid all danger of the oil collecting at that point." *(U. S. Div. of Ent., Bull. 9, N. S.)*

In view of these facts, it seems impossible to doubt but that if Prof. Smith's instructions are followed carefully we may have in kerosene (ordinary coal oil), a remedy of great value. At any rate, it is well worth the while of any one who has fruit trees infested with San José or other scale insects to risk the losing of one or two trees if he can discover a remedy which will save his whole orchard. Care should be taken to mound up some loose soil around the base of the tree treated to catch any superfluous oil. This should be taken away again after the spraying, to prevent the oil from injuring the roots.

2. *Whale-oil soap* is the remedy which I have recommended to my correspondents to be applied, as advised by Dr. Howard, in the dilution of only one gallon of water to two pounds of the soap, the trees to be washed or sprayed with the mixture during the winter, some time after the leaves fall in the autumn, and again the following spring, before the buds open.

One of the chief difficulties with "whale-oil" or fish-oil soaps is the want of uniformity in their composition. It has been found after many experiments at Washington that what is required for spraying purposes is a caustic potash and fish-oil soap which does not contain more than 25 per cent or 30 per cent of water. Mr. Marlatt states that a brand of soap known as "Good's Caustic Potash Soap No. 3" is perhaps the best which has been recently put on the market. This is a soft soap, which is shown by analysis to be a true potash soap, containing about 27 or 28 per cent of water. Soaps made with caustic soda have been found unsuitable for spraying purposes. Mr. Marlatt concludes his account of the Washington experiments up to date as follows:—"Our examination of the soap question up to the present time seems to indicate that we shall have to insist on a potash soap made with a fair quality of fish or Menhadden oil, and that the water should be eliminated by boiling, so as not to exceed at the outside 25 per cent of the weight of soap. Such soap can be used at the rate of 2 or $2\frac{1}{2}$ lbs. or more to the gallon of water, as a winter wash, without difficulty."

3. *Gas treatment*:—For thorough work in treating infested nursery stock, the fumigation with hydrocyanic acid gas seems in California to have given the best satisfaction. This method, however, is expensive and the materials used are intensely poisonous. However, for large nurseries where many young trees have to be disinfected before being sent out, this is the best method and is very generally adopted by the large American nurseries. * The plants are placed under a canvas tent made air-tight by painting it twice with linseed oil. The first coat must be quite dry before the second is applied. the size of the tent is immaterial, but it must cover the trees entirely, and its edges should be long enough to lie on the ground, so that the tent may be made perfectly air-tight by having earth thrown upon the edges to prevent the gas from escaping. The latest formula for generating the gas is as follows, for every 100 cubic feet of space to be fumigated:—

Cyanide of potassium (98 per cent)	1 ounce.
Sulphuric acid (66°)	1 "
Water......................	2 ounces.

Put the acid and water in an earthenware vessel, large enough to prevent spattering, then place the jar under the tent, add to it the cyanide of potassium and close the opening quickly. The trees should remain exposed to the gas for at least 45 minutes, when it will be found that insects of all kinds have been destroyed. For the fumigation of nursery stock before shipping, many of the large United States nurseries

*Full details cannot be given here, but will be supplied on application to any one requiring them.

have special buildings in which all trees and shrubs are treated whether known to be infested or not. To save time, these buildings are divided into two compartments, so that one may be emptied while the stock in the other compartment is being disinfected. For treatment of a small number of trees a box may be rendered air tight by pasting paper over all cracks and openings.

4. *Lime-Salt-and-Sulphur Wash* :—This wash is one of the favourite washes on the Pacific coast and has certainly given excellent results in British Columbia. Mr. R. M. Palmer has found it most satisfactory for some years and in his last report refers to it as follows :—"Another year's experience with the No. 1 spraying mixture (lime, salt and sulphur) has added further evidence of its value as a winter wash for all kinds of fruit trees and bushes. It is generally noted that so much improvement results from its use in the health and vigour of the trees to which it is applied, as alone to justify the cost of the work."

Mr. Marlatt, when in California, noticed the same good results there in the vicinity of Pomona, Cal., where "unsprayed orchards were badly infested with San José Scale, while in adjoining sprayed orchards the scale was entirely killed and the trees were rapidly recovering and showing vigorous and healthy new growth. In contiguous orchards also of the same kinds of trees which had been cultivated in a similar manner, those trees which had been sprayed yearly were at least one-third larger than the others."

The mixture which Mr. Palmer has found so valuable is as follows :—

"Lime, unslaked...............	30 pounds.
Sulphur, powdered.............	20 "
Salt, coarse...................	15 "
Water	60 gallons.

"Place 10 pounds of lime and 20 pounds of sulphur in a boiler with 20 gallons of water, and boil over a brisk fire for two hours, until the sulphur is thoroughly dissolved. It will then be amber-coloured. Next, place 20 pounds of lime in a cask and pour enough water over it to thoroughly slake it. Add the salt. When dissolved, add to the lime and sulphur, and boil half an hour longer. Add enough water to make 60 gallons. Apply lukewarm. Spray when the trees are dormant, or as soon as the leaves fall, and again in the spring before the buds swell. A good force pump should be used, and care must be taken to cover the infested trees thoroughly with the mixture, which should be constantly stirred when applying.

"To insure freedom from lumps, it is advisable to pass the mixture through a wire sieve or strainer."—[R. M. Palmer, *Insect Pests and Plant Diseases*, Victoria, B.C., 1897.]

Prof. J. B. Smith also speaks of the good results obtained with this wash on the Pacific coast in his Annual Report for 1896, p. 487 :—"In Yuba and Sutter counties, the lime, sulphur and salt wash is the favourite. The testimony to its efficiency is universal. Few claim that a single spraying is absolutely effective; all contend that two sprayings will kill practically all the scales. Absolutely perfect work cannot be expected, and so there is always a small amount of scale in the orchard; but, as they have found that the use of this wash is beneficial to the trees by seeming to make them more vigorous, less liable to fungus attack and, in the case of peach trees, less susceptible to leaf curl, the spraying is continued every year, whether the scale is abundant or not. A man who does not spray is considered a very poor farmer."

The above quotations are given for the benefit of British Columbia fruit growers, all of whom are urged to take the fullest advantage of the excellent work which is being done by Mr. R. M. Palmer, Inspector of Fruit Pests. His Annual Reports to the Provincial Board of Horticulture are indispensable to the farmer, fruit grower and gardener, in all parts of the province.

This valuable remedy of the West, however, it must be acknowledged, has not given satisfactory results in the East, Mr. Marlatt even going so far as to say, while acknowledging its value in the West :—"Our experience with the wash in the East had thrown doubt on its real efficiency as an insecticide, and it has been clearly demonstrated that under the climatic conditions east of the Alleghanies it is almost valueless."

Whatever the reason may be for this great difference, the value of the remedy for the West is undoubted and well attested. Similarly, the gas treatment has given less satisfaction in the East than on the Pacific coast, but this is to some extent due to the difficulty of treating deciduous trees, such as are infested by the San José Scale, which have a more spreading, open growth than the close-growing, thick-foliaged trees of the Citrus family, upon which this method is chiefly used in California for other kinds of scale-insects. For the disinfection, however, of nursery stock, the gas treatment is certainly most convenient. Probably the remedies which will be found most available for Ontario fruit growers will be the whale-oil soap wash and the kerosene emulsion. The latter should be applied as soon as the leaves drop or during the winter, made according to the Riley-Hubbard formula and diluted with only four parts of water, to be followed before the leaves expand in spring by the whale-oil soap wash, 2 pounds in 1 gallon of water.

Mention may be made of the fact that where trees are closely planted the scale has spread more quickly than where the trees are farther apart. This points to the advantage of having the trees planted as wide apart as possible without waste of land.

Since the San José Scale is already established in several centres in Ontario, it is now too late to prevent its introduction into the country; still, no effort should be relaxed which will prevent further importation from infested nurseries in the United States, and it should not be forgotten that nearly all of the Canadian outbreaks have been traced back to nurseries in the State of New Jersey. There are some precautions which common sense would seem to dictate to all fruit growers, such as: (1) Do not buy either from nurseries known to have been infested, or, as it is unnecessary, even from States where the scale is known to exist. The home grown trees of all our Canadian nurseries are much safer to purchase than those coming from any of the usual sources in the United States. Up to the present not a single Canadian nursery has been found to be infested.

(2) Examine all trees upon your own grounds and upon your neighbours', particularly those which have been planted or grafted during the last five years.

(3) Plant no young trees without examining them carefully for any trace of the San José Scale. Should any case of infestation, or even suspected plants, be found, at once report the matter and send specimens for examination to the Government entomologists at Ottawa or Guelph for advice.

On account of the exceedingly inconspicuous nature of this enemy and its habit of hiding beneath scales of bark, buds, etc., as well as the extreme danger which attends its introduction, in those cases where it is considered necessary to purchase from American nurseries, it would be well for fruit growers not to trust to the certificates that the trees are free from scale, which are sometimes supplied by nurserymen, unless they are actually signed in writing by state entomologists of recognized standing, and also for the actual consignment of trees with which they are imported.

As an illustration of the difficulty of detecting the young scales when they are few in number, Prof. F. M. Webster has published an illustrated article in the current December number of *Entomological News*, showing a twig from a peach tree which had been submitted to him for inspection and of which he says: "The most diligent search with a lens failed to reveal any outward trace or indication of the presence of San José Scale. When one of the buds was removed it was found that there was behind it a half grown scale which had been completely covered and concealed by the bud." This showed that practically no one could be certain that a tree was absolutely free from scale without removing all the buds, which of course is out of the question.

THE APIARY.

The practical management of the Apiary, as heretofore, has been satisfactorily carried on by Mr. John Fixter, the Farm Foreman. The interest shown in the Apiary has been very encouraging; large numbers of visitors have examined it, who have been gratified by the attention shown them and by the explanations given in all matters connected with bee-keeping. One experiment was particularly observed, namely, what has been called the "House Apiary." This is treated of by Mr. Fixter in his report appended hereto. Many of the experiments begun in former seasons have been continued; but those on wax foundations were not taken up this year. In addition to the explanations given to visitors, two valuable addresses were delivered by Mr. Fixter to the students of the Ottawa Normal School upon the subject of bee-keeping, and he also attended two meetings of Farmers' Institutes, one at Russell Village, Russell County, Ont., and the other at Bell's Corners, Carleton County, Ont., at both of which the directors of the institutes requested that the subject of bee-keeping should be brought up.

The season at Ottawa, with reference to bee-keeping, has been a very remarkable one. Although in June there was a good amount of blossom on flowering plants, bee-keepers in the district were all surprised to find how little honey was stored by their bees.

Notes are being taken, with the dates, of the different kinds of flowers which are attractive to bees, and will be published at some future date. The Breaking Buckthorn, or, as it is more generally known, the Alder Buckthorn (*Rhamnus Frangula*), was noticed to be particularly visited and for a very long period by bees. A supply of the seed of this shrub was, therefore, collected and distributed to all bee keepers who asked for it before the supply was exhausted.

The condition of the Apiary I consider quite satisfactory, and it is a branch of the Farm work which is growing in popularity from year to year (a fact, it must be stated, almost entirely due to Mr. Fixter's skill and good management).

Results of the Work of the Season.

On August 28th all the supers were removed from our hives, when 212 partly filled sections were found. This was all the surplus honey which had been made during the year, and the whole of this was returned to the bees for their winter sustenance. It should also be mentioned that not only has there been an entire lack of surplus honey, but the bees have also failed to swarm, so that the number of colonies was not increased. These results appear the more extraordinary when we consider the large quantities of honey made per colony during the past two years. In 1895 the average was 54 sections per colony, and in 1896 it was 50 sections, besides 16 lbs. ½ oz. of extracted honey per colony, all having been under the same management and care. There seems to have been an unusual deficiency of nectar in the flowers. The bees worked industriously, but were barely able to accumulate enough for their own subsistence. Indeed it was necessary to supplement their stores with considerable quantities of sugar in order to keep them supplied.

This discouraging condition of affairs prevailed all over the eastern parts of Ontario. In the western parts of that province better results are reported.

The following extracts from letters received will show the peculiarity of the season of 1897, in the Ottawa district:—

"Ottawa, January 7, 1898.—As you are probably aware last season was one of the most peculiar, if not the most peculiar, in the history of bee-keeping in this section of Canada.

"Soon after my bees were removed from winter quarters I noticed that although seemingly working hard every fine day, they were getting little if any honey, and were very rapidly using up the balance of their winter supply. I think I am safe in saying they got nothing from either maple, willow or fruit bloom, that is to say, early fruit bloom such as apple, plum, cherry, currant, &c. After my bees had been out about a week I began feeding systematically every evening, giving perhaps half a cupful to every hive, and by the beginning of May, even with this amount of feeding, they were still drawing heavily on the not very large amount left over from wintering, so much so that by the second week in May scarcely a colony in all my apiary had more than a very little unsealed honey and the hives were absolutely filled with brood, more so than I have ever seen them before, many of the frames having brood in the first row of cells from the top bar of the frame.

"I could not detect any honey being brought in until after the 24th of May, and then only in small quantities from the raspberry bloom. I fed steadily until the 23rd of May, and am quite satisfied that I realized handsomely by doing so. It is perhaps worth mentioning here that in the spring of 1896 all my strong colonies filled the two outside frames so full of honey that I removed them and put empty frames in the hives between the middle frames. The flow was from the willow. Swarming began on the 4th of June, and I have never had finer swarms than during the past season, the great trouble was there appeared to be no end to the swarming season, as I had several swarms in September, as late as the first week, when buckwheat honey was coming in freely.

"I took 45 hives out of winter quarters, having put away 46; the one lost was from dampness, it was touching the outside wall of the cellar. I sold two colonies just before swarming, and by the end of September I had 90 good colonies, most of them very heavy with honey, even the late swarms in September filled up well with buckwheat and goldenrod (Solidago) and required very little feeding to bring them up to the 55 pound limit. I sold 25 colonies this fall and have 65 in the cellar now. My total yield of comb honey was a little over 1,100 pounds, of which two thirds was white clover, basswood and possibly some raspberry mixed, the balance was goldenrod and buckwheat mixed, making a quite agreeable honey.

"I have an idea that the reason of the excessive swarming was partly on account of the honey flow being very intermittent, perhaps two or three days of a heavy flow and then several days with little or none. During the idle days the working force would hang about the hives and amuse themselves building queen cells. Then in a few days out they would come. The total return for the past season by the sale of bees and honey was $325, less about $15 for honey fed in the spring."—[Percy H. Selwyn.]

"Almonte, Jan. 12, 1898.—This year I got no white honey. Last year I had between 2,500 and 3,000 pounds. This year's dark honey was about 20 per cent of last year's, and similarly, new swarms were about 20 per cent of last year's. As for feeding, I do not do much of that. Most of my colonies go into winter quarters heavy with natural stores; but some of the old colonies had none too much, and two or three of the new ones this year did not actually gather enough to winter on."—[J. K. Darling.]

"Chard, Ont., Dec. 27.—I set out 105 colonies on April 23. I had a few colonies set out some days before that. The first pollen was seen coming in on April 22. By July 1, through robbing and starving my colonies were reduced to 70. At the end of the season these were increased to 82. I got 500 lbs. comb honey and 1,500 lbs. extracted, all dark honey. Another bee-keeper here says he began the season with 40 colonies. He had no increase in swarms. He got 50 lbs. comb honey and 860 lbs. extracted, all dark honey."—[W. J. Brown.]

"Bearbrook, Jan. 8, 1898.—I never experienced such a hard spring and summer since I have kept bees. I carried out 22 hives. Four or five were weak, so I united four colonies into two. I ran 4 of my strongest hives for comb-honey and 16 for extracting. The spring was cold and dark, and the summer hot and dry. There was no clover until September, perhaps a little in August; but I never saw such a fall harvest. My bees never did better, even in June and July, than they did for me this year in September off the wild flowers, which grow on the low swampy land along streams. The honey was dark, but of a delicious flavour.—[A. R. McRae.]

REPORT OF MR. JOHN FIXTER.

SEASON OF 1897.

April 5.—Hives all taken out of their winter quarters and placed on their summer stands. The bees came out at once and flew well.

" 6.—Cloudy, but not cold; no flying.

" 7.—Fine but cool; flying well.

" 8.—Fine, cool toward evening; bees flying about three hours.

" 9.—Dull day; no flying.

" 10.—Warm; some flying.

" 11.—Warm: bees flying well, some bees attempting to rob; openings closed to one bee's space.

" 13.—Cold and wet; little flying.

" 16.—First pollen gathered from swamp willows.

" 17-20.—No flying.

" 21.—All bees flying and gathering pollen off different species of willows.

" 22.—All flying and working on the flowers of the Siberian squill.

" 22-May 11—Working well, gathering pollen.

May 11.—Plum trees and dandelion beginning to bloom. Bees very thick on both.

" 13.—Bees working well on wild cherry.

" 19.—Cherry and apple trees in bloom, very attractive to bees.

" 25.—Bees working on the Siberian pea tree (*Caragana*).

June 1.—Many dead drones and some worker bees were carried out to the entrance of several hives, a most unusual occurrence at this season of the year, a result probably occasioned in some instances by scarcity of new honey. A very close inspection being made, several hives were found to be short of stores and had to be fed, although there were many plants and shrubs at that time blooming.

" 9.—The Bush Honeysuckle (*Lonicera Tatarica grandiflora*) came into bloom.

" 13.—White clover coming into bloom; notwithstanding the abundance of bloom, no increase in honey was observed.

" 13-15 and later.—Bees working on white clover, alsike clover, Alder Buckthorn (*Rhamnus Frangula*), also raspberries and Mock Orange (*Philadelphus*). All hives fed on syrup, very little new honey having been gathered.

" 15-20.—Weather very fine. Bees flying well but no honey appeared to be gathered.

" 25.—All flying and working well on white clover and alsike, carrying in some pollen, no surplus honey being stored at this date. Several hives fed with syrup (made by dissolving two parts sugar in one part water, the sugar being added to the water while hot and stirred until dissolved). Bees beginning to improve, showing signs of greater vigour.

" 30.—Fine weather: bees flying freely. Some new honey was stored by the strongest colonies; it was, however, found necessary to feed some hives.

July 1-6.—Bees working well; all hives gained rapidly in weight during this period.

" 6.—Bees working well.

" 11.—Basswood just coming into bloom; flowers scarce, and, on account of the extreme heat of the weather there was but little gain in weight from this source.

" 18.—Bees working on basswood, buckthorn, Catalpa and also on asparagus.

" 24.—Bees working on horse beans. Buckwheat in bloom and bees working on it.

Aug. 1.—Buckwheat honey was gathered freely.

" 1-28.—The weather was very fine and bees were flying well, but very little surplus honey was stored. All supers were removed; 212 partly filled sections taken off, which were afterwards returned for winter stores.

Experiments in Wintering (1896-97).

Experiment No. 1.—Nov. 16, 1896.—Fifteen colonies were put into winter quarters in the cellar and placed on the shelves, beginning eighteen inches from the floor. Under the back end of each hive was placed a three inch block, by which means the back of each hive was raised so as to ensure free ventilation. Each hive was raised from its own bottom board three eighths of an inch at the back. All front entrances were left wide open, the wooden covers all removed, leaving the propolis quilt on 12 hives and placing a chaff cushion four inches thick on each. On the remaining three hives no propolis quilt was used, but the chaff cushion was laid close to the frames. No difference could be seen between the colonies having on the propolis quilt and those which had none, that is, as to dampness, &c.

Temperature was taken once a week all through the winter :—

	Highest.	Lowest.
November 16 to 30	46	40
December	44	43
January	44	43
February	45	43
March	46	42
April	46	..

The bees were quiet throughout the winter, very slight hum being noticeable.

On April 5 all hives were removed to their summer stands. The temperature was kept regular in the cellar by means of a coal stove and careful watching. The stove was placed in an adjoining room, and was lit when the temperature was low or the cellar damp. The stove and ventilators require a great deal of watching, so as not to allow sudden draughts of warm or cold air, as either disturb the bees too much.

As the advantageous use of the coal stove requires experience, at present I would not recommend it to beginners.

Since the cement floor, shelving and complete ventilation have been put in the cellar, it has given entire satisfaction.

During the past winter every colony in this experiment was perfectly dry and clean and showed no uneasiness of any kind, and all came out in excellent condition.

Average weight of each hive when put into winter quarters was 51 pounds ; when taken out on April 5, the average weight was 41 pounds 10 ounces per hive, showing that each hive had lost 9 pounds 6 ounces, which was rather less than the usual amount, owing to the comfortable cellar.

Experiment No. 2.—Colonies Nos. 14 and 20 were put into the cellar with tops and bottoms of hives left on, just as they were brought in from the bee yard. These were to be watched for dampness. During November and December there was a slight hum in both hives, but they were quite dry.

Jan. 11.—Hive No. 14 was damp and noisy ; hive No. 20 was dry.

Feb. 1.—Both quite dry, but there were many dead bees at the entrance of hive No. 14.

Feb. 8.—Colony No. 14 very noisy and hive damp ; cover removed and ventilation given at bottom by raising the front entrance an additional two inches.

Feb. 22.—Both hives perfectly dry and quiet.

Mar. 1-29.—Hive No. 14 had some spots of fæces on the entrance, and when removed from the cellar on April 5 there was about one inch of dead bees and some mould on the bottom board, but the bees were in fair condition, as the colony was a large one.

April 5.—Hive No. 20 noisy, but dry ; very few dead bees on bottom board. Total weight of the two hives when put in, 105 pounds ; when taken out, 82 pounds. No. 14 weighed 13 pounds less, hive No. 20, 10 pounds less than when put into winter quarters.

May 24.—Hive No. 14 had 7 frames of bees and 5½ frames of brood ; hive No. 20 had 8 frames of bees and 6½ frames of brood.

Experiment No. 3.—Hives stored in a root-house. Two colonies, Nos. 4 and 6, were kept in a large root-house, which is 100 feet long, 25 feet wide and 10 feet deep. The hives were placed on a shelf nailed up against the side wall, about 3 feet from the ceiling and projecting 2 feet. A curtain was hung from the wall over the top and down in front of the hives, so as to keep out all light. The propolis quilt of hive No. 4 was taken off and a chaff cushion put on in its place. The propolis quilt was left on hive No. 6 and a chaff cushion placed above it. The fronts of both hives were raised an additional half inch to give free ventilation.

Temperature was taken every Monday of each week.

Nov. 3-6.—Bees in both hives quite dry, but making considerable hum.

December.—Temperature of root-house, highest 38, lowest 36; both colonies noisy and quite damp, scarcely any dead bees on bottom of hives.

January.—Temperature of root-house, highest 39, lowest 37; both colonies very noisy, damp and mouldy.

February.—Temperature of root-house, highest 39, lowest 37; both hives quite damp and mouldy. Colony No. 4 showed signs of dysentery.

March.—Temperature, highest 43, lowest 35; both hives showed signs of dysentery; some few bees coming out of both hives; very few dead bees around either.

April 5.—Both hives removed to bee-yard. Both colonies showed signs of dysentery, dampness and mould, but both were very strong in numbers.

Another experiment was also carried on with these two hives; the propolis quilt was left on hive No. 6 between the chaff cushion and the frames. On hive No. 4 no propolis quilt was used, the chaff cushion being placed next to the frames; the object of this was to see if the propolis quilt was liable to hold the moisture in the hives.

After careful watching all the winter, no difference could be noticed.

Weight of hive No. 4 in the autumn of 1896, 60½ pounds; in the spring of 1897, 45 pounds a loss of 15½ pounds.

Weight of hive No. 6 in the autumn of 1896, 63 pounds; in the spring of 1897, 50½ pounds, a loss of 12½ pounds.

Another examination was made on May 24. Hive No. 4 had 5 frames of bees and 4 frames of brood.

Hive No. 6 had 7 frames of bees and 6 frames of brood, so that they were in excellent condition for a honey flow.

Experiment No. 4.—Nov. 16, 1896.—Colonies Nos. 1 and 3 were put into a pit dug in the side of a hill, 3 feet deep by 3 feet in width and 10 feet long, in such a way that the ventilators at both ends might not be immediately above the hives, which were in the middle of the pit. The hives rested on two cedar poles laid the full length of the pit. A third cedar pole of the same length was laid in front of the entrance of the hives, and insured the necessary circulation of the air from the two ventilators one at each end of the pit. These ventilators, which were 3 inches by 4 inches were made of boards, three of which reached down to the bottom of the pit, the fourth only to the top of the pit, and the ventilators rose three feet above the ground. In each hive half inch strips of wood were laid under both sides and under the back end, between the brood chambers and the bottom boards, so as to provide more space at the bottom of the hive in case a quantity of dead bees should accumulate there.

The pit was filled up with loose straw up to four inches from the top, which was made of cedar poles along the length of the pit, the middle ones higher than the others, covered with a layer of straw and one foot of soil. A small shaft was also arranged between the hives, down which a thermometer could be let by means of a string, so that the temperature of the pit could be ascertained. The thermometer was examined once a week. If the temperature rose too much, some of the covering might be removed; and if the contrary, some added. Temperature was taken once each week.

Temperature for November was 42 each time it was taken, and no sound was heard at any time through the shaft or ventilators.

Temperature for the first two weeks of December was 42; remainder of month, 39. On December 21, one foot of horse manure was placed over the pit to try and raise the temperature, but no difference was appreciable.

The temperature for February and March was 39, and did not vary one degree during the two months.

The temperature of the pit on April 5, was 40; the day being very fine, both colonies were removed to the bee yard

Hive No. 3, was very damp and mouldy, and had half an inch of dead bees on the bottom board, but no evidence of dysentery.

Hive No. 1 was also very damp and mouldy and the entrance had some evidence of dysentery; on the bottom board there was about half an inch of dead bees.

Mice had found their way into the pit, but had not been there long enough to do any harm.

The weight of hive No. 1, in the autumn of 1896, was 50 pounds, and in the spring of 1897, 40 pounds, a loss of 10 pounds.

The weight of hive No. 3, in the autumn of 1896, was 52 pounds, and in the spring of 1897, 44 pounds, a loss of only 8 pounds.

May 24, another examination was made as to the strength of the colonies.

No. 1 had 7 frames of bees and 6 frames with brood.

No. 3 had 8 frames of bees and 6½ frames with brood.

This experiment, therefore, is very satisfactory, and the method is one which can be adopted at small expense by any one who wishes to keep bees. Care must be taken to choose a well drained spot for the location of the pit, and to cover the ventilators with wire netting to keep out mice.

Experiment No. 5.—Wintering in wood shed (house apiary).

Two colonies, Nos. 46 and 48 were left in the wood shed with some additional packing as stated in last year's report, page 270.

The wood shed has walls which are double boarded, with an air space of four inches. The floor, which is about one foot from the ground is also double boarded and there is no draught under it. The hives were moved one foot from the wall, and placed on a double thickness of sacks laid on the floor; the wooden covers were removed and replaced by cushions. In addition to this, the hives were covered above and all round with a double thickness of the same packing. No ventilation was provided for one hive (No. 46); for the other, (No. 48), a small shaft half an inch square extended from the opening of the hive to the outside of the shed, and half inch strips of wood were placed under both sides and under the back, and between the bottom boards and the brood chamber, so as to give more space at the bottom of the hive in case a quantity of dead bees should accumulate.

No flying took place from the time they were packed until they were opened in the spring.

No difference could be noticed as to strength of colonies.

April 5, both hives had two inches of dead bees on the bottom boards and were damp and mouldy, and both colonies were in a very weak condition.

Another examination was made on April 22, when both hives were found to be deserted.

Hive No. 46 weighed in the autumn of 1896, 63 pounds, and in the following spring it weighed 48 pounds, showing a loss of 15 pounds.

Hive No. 48 weighed in the autumn of 1896, 53 pounds, and in the following spring it weighed 37 pounds, a loss of 16 pounds.

Conclusions.—The mode of wintering that has given most satisfaction is No. 1.

No. 2. Hives put in the cellar as they came from the bee-yard had not sufficient ventilation. This result agrees with that of last year. During the winter of 1897-98 this experiment is being repeated and also two hives have been stored in the same way except that the wooden covers have been removed, leaving nothing but the propolis quilt.

No. 3. Wintering in a root-house. This experiment was fairly satisfactory, but the hives were too damp. An effort is being made this year to keep the hives drier, by having more ventilation at the bottom.

No. 4. Wintering in a pit out of doors. This experiment was satisfactory, but is being tried this year without filling up the pit with loose straw as was done last year, and two inches of space have been left both at the back and in the front of the hives for better ventilation.

No. 5. Wintering in a closed shed, the hives being merely protected with a double thickness of sacks above and all round them. This experiment was a failure. The cold of winter destroyed most of the bees, very few being alive in spring. The experiment is tried again this winter with the hives placed farther from the outside wall and with more protection against frost.

House Apiary.

An experiment was carried on in a wood-shed, a part of which was partitioned off for that purpose and is now called the House Apiary.

This house apiary opens into a yard that is 30 by 60 feet, surrounded by a close board fence 6 feet high, which gives an excellent shelter from prevailing winds. Both the south and east sides of the shed are covered with grape vines, which seem to keep the building cool during the very hot weather, and the vines are trained so as to leave the entrances perfectly clear. One part of the space in the shed devoted to this purpose faced the south-east and was 7 feet high, 6 feet long and 4 feet wide.

In this portion were placed two tiers of hives ; the bottom tier was set on the floor, which is one foot from the ground and double-boarded. The second tier was set on a shelf 3 feet 6 inches from the floor.

Another portion of the shed facing the south-west 7 feet high, 4 feet wide and 32 feet long. There were here 12 hives in one row upon the floor.

From the experience of the past year gained with the part first mentioned, I would recommend two tiers on the south-west side, so that the vacant space might be profitably occupied. The entrances to the hives were 3 feet apart and were cut through the wall of the shed ; they were 6 inches by 6 inches, with an alighting board projecting 7 inches by 12 inches wide and sloping so as to throw off rain. The hives are set close to the wall, so as to confine the bees to their own hives.

Conclusions.—During the past two summers the colonies in the house apiary, which is surrounded by an inclosed yard, having more shelter from the cold winds of both spring and autumn, were frequently observed to be flying, while the colonies in the exposed open apiary remained in their hives.

Another advantage of this arrangement is that there is less danger of robbing. When the hives are being inspected the examination is obviously more convenient in wet weather, being under shelter ; further, if the apartment were made 6 feet wide, instead of 4 feet, and a shelf placed on the wall to hold bee appliances, this would add greatly to its convenience. The alighting board might be made to project only 6 inches and be 10 inches wide.

GRASSES.

AWNLESS BROME GRASS

(*Bromus inermis*, Leyss).

One of the most valuable pieces of work which has been accomplished by the Experimental Farms is the successful introduction into Canadian Agriculture of the Awnless Brome Grass, which, on the whole, has done better than any other introduced grass we have sent out for trial, both for hay and for pasture. The seed of this grass was imported from Russia during the first year of the institution of the Experimental Farms, and it has been grown ever since, with remarkable success. Every year small packages of the seed have been distributed free, in every province of the Dominion to such farmers as have asked for samples, and the reports received from them have been most satisfactory. On the prairies of the West, where, on account of the rapid settlement of the country and of the increase in the numbers of stock, the native grasses are now failing, the Awnless Brome grass is found to be a most useful substitute.

The seed germinates readily and the young plants soon become established. It is a perennial grass with running root-stocks, and is conspicuous for its free leafy growth and tall stems (3 to 5 feet high), which bear an abundance of seed. It flowers at Ottawa in the last week of June or the first week of July. It is very hardy and early, and produces a large crop of hay, which, although rather coarse-looking, is soft, sweet-smelling and palatable to all stock; chemical analysis also shows that it possesses great food value.

Not only does Awnless Brome grass thrive in the rich, moist soil of the eastern provinces, but its growth and productiveness are so wonderful, even it the dry plains of the West, that its cultivation, together with that of the Western Rye-grass (*Agropyrum tenerum*, Vasey),—another most valuable grass, a native of North-western America, which indeed is the well known "Bunch Grass" of the West,—may be said without exaggeration to have solved the problem of fodder production on a large scale in the arid western sections. Under irrigation on the farm of Mr. Wm. Hull, of Calgary, Brome grass has given on 200 acres of land the enormous yield of $4\frac{1}{2}$ tons of grass per acre. It seems to stand a little more water than Timothy when irrigated. On good lands in the east it produces without irrigation from $1\frac{1}{2}$ to $2\frac{1}{2}$ tons of hay per acre.

One notable feature which distinguishes this grass, is that, while most grasses after the flowering period deteriorate rapidly while the seeds ripen, Awnless Brome grass can be left standing till the seeds are fully ripe, and yet the hay crop will be heavier, without being poorer, than if it had been cut when in flower, as should be done generally for all hay grasses in order to get the best value. This remarkable characteristic of Brome grass is due to the fact that after the seed-bearing stem has grown up, a great number of leafy sterile shoots spring up from its base. It is owing to this supplementary growth that the straw, after threshing, still makes hay of excellent quality.

A special value for this grass has lately been discovered, namely, its adaptability for alkaline soil. Mr. Mackay, having tried some experiments, reports as follows:—
"Indian Head, Assa., Nov. 12.—The Brome grass on alkaline land, which I referred to in speaking to the Committee on Agriculture while in Ottawa, was grown on two low spots in a field of about 15 acres. The spots are not very large ($\frac{3}{4}$ acre in both), but, before sowing, the bottoms were white with alkali, though not so bad as low places in other districts. A good many crops had been grown on the field prior to the grass being sown, and no doubt have had some effect on the alkali. It seems to me as if alkali washes out of the soil into low spots, for we find it in varying quantities in places where water stands for a few days and then settles into the soil. Last June we had a deluge of rain, leaving us a 5-acre plot in one of the grain fields covered with water

until September. That spot is covered with alkali now, and so far as I know there has been no alkali there before.

"The crop of hay on the $\frac{3}{4}$ acre was very heavy, but the land being moist would cause a good crop in any case. Part of this year's crop of Brome hay was grown on low places, upon which alkali is observed every year we plough them; and in these places the crop was very heavy. As no record was taken of the yield on the alkaline spots, I cannot give any exact quantity per acre, but there was at least one-third more hay on them than on the ordinary land."—[Angus Mckay.]

"Urquhart, Alta., Nov.—The 1-pound bag of seed received was sown June 11, on 330 square yards of a field which had been sown with grain for the two previous years; but in this particular position little or nothing had grown, the soil being alkaline clay, which is always baked hard in summer. The ground was ploughed in May and well harrowed, and again harrowed previous to the grass being sown, in order to destroy the weeds. The grass grew to a height of 16 inches, but not vigorously over all the ground, some patches being quite bare. It was green and fresh when all the surrounding grass on field and prairie was withered and dead from the early frost. It was not cut. I feel satisfied that it will be a capital grass for hay or pasture, and I intend to sow the whole field (7 acres) with this grass."—[P. McDonald.]

The above quotations suggest a special value in this most excellent grass which was not thought of at the time it was introduced.

In certain parts of British Columbia, the two native species *Bromus Pumpellianus*, Scrib., which closely resembles *B. inermis*, and a large succulent species, *B. brevi-aristatus* Buckl., have been preferred by some growers and further experiments with these species are now being carried on.

REPORT OF THE POULTRY MANAGER.

(A. G. GILBERT.)

To Dr. WILLIAM SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

I have the honour to submit herewith the tenth annual report of the Poultry Department. The work of the year has been principally in the line of feeding reduced rations, and noting—

1. Effect in increased, or, decreased output of eggs.
2. On the general health of the laying stock.

The results were most gratifying and are given in the following pages, with full particulars of the change in quantity and value of the rations. The experience gained cannot fail to be of interest and value to all those desirous of obtaining eggs from their laying stock, in winter, at the least possible cost.

Details are also given of the experimental managing and feeding of 50 hens, as requested by the members of the Committee on Agriculture, of the House of Commons of 1896.

There is a marked increase in the correspondence of the year and no little part of it is devoted to inquiries as to the best means of artificially hatching and rearing of early chickens, ducks, &c.

Addresses on the care and management of poultry, markets for eggs and kindred subjects were delivered at the following points during the year, viz.:—

ONTARIO—Lanark, Kingston, Guelph, Monklands, Moose Creek, Maxville, Quigley, Summerstown and Smith's Falls.

QUEBEC—Montreal.

NOVA SCOTIA—Grand Pre and Cornwallis (2).

NEW BRUNSWICK—Fredericton, Upper Maugersville, Hampstead, Long Reach, Riverside, St. Joseph's College, Pointe de Butte and Sackville.

PRINCE EDWARD ISLAND—Charlottetown, Alberton, Summerside and Georgetown.

A new feature at the Smith's Falls meeting was the exhibition of poultry, killed and dressed, to suit the requirements of the British market. The poultry was killed and dressed on the Experimental Farm by an expert. The exhibition consisted of turkeys, geese, ducks and chickens and was closely examined by a large number of farmers and their wives. As an interesting and instructive object lesson it was much appreciated.

I have the pleasure of again testifying to the zeal and energy of Mr. George Deavey to whose faithful carrying out of instructions given and interest taken in the work much of the success attained is due.

I have the honour to be, Sir,
Your obedient servant,
A. G. GILBERT.

REPORT OF THE POULTRY MANAGER.

The work of the past year has been unusually important and successful. Important, because it embraced the experimental feeding, to the laying stock, of a less quantity of cheaper rations than formerly. Successful, for the reason that a greater number of eggs was obtained, during the winter period of high prices, at a lessened cost of production. It will be interesting then to the farmers and poultry breeders of the country to learn how such results were brought about.

WHAT CLOSE OBSERVATION LED TO.

The experience of former years led first to the suspicion and finally to the conviction that the great drawback to successful winter laying was the hens becoming overfat—particulary those of the Asiatic and American breeds—from overfeeding and consequent disinclination to exertion. This was more noticeable when the soft mash morning ration was fed, as was thought, in too great quantity. It was also noticed that the overfat condition was more general and disastrous about the end of February, or beginning of March. The indications of an overfat condition were:—

1. The laying of eggs with thin or soft shells.
2. Eggs laid of abnormal size and unusual shape.
3. The sickness of several of the laying fowls from an ailment at first thought to be acute indigestion, but later supposed to be enteritis or inflammation of the intestines, and which in the majority of cases resulted in death.
4. The sudden death of several two and three year old hens, of the large breeds, from apoplexy.

SIMILAR CASES ELSEWHERE.

Investigation received incentive by the reception of several letters, from persons in different parts of the country, describing an ailment which affected their fowls, and similar to that noted in the farm fowls. The following letter may be taken as a specimen of those received, and describes the symptoms:—

"Dear Sir,—My hens are suffering from some disease. They have been laying well up to this time (end of February and early March). They seem to lose the use of their legs and lie on their sides. They seem feverish and distressed. Some get over it, others die. We give them mash in the morning and grain at other times. They have water to drink and old mortar for lime."

In the case of the farm fowls, castor oil in small doses was given with a ration of soft food, and the correspondents were advised to try the same.

The ailment was a new experience and experts consulted thought it a form of acute indigestion.

SOME LIGHT ON THE MATTER.

What was the ailment? It seemed an outcome of the overfeeding, over stimulating (and consequent overfat condition) of the laying fowls, in the attempt to procure eggs in winter. Some light was thrown on the subject by the publication, by Dr. W. Sanborn, of a book on poultry diseases, in which he describes "Enteritis," the symptoms of which so closely resembled those of the sick fowls of correspondents and farm, as to make conjecture almost a certainty. Dr. Sanborn thus writes:—"Enteritis, an inflammation of one or more of the intestines, has received much attention and investigation of late."

Cause of Disease.—Feeding too stimulating or irritating foods; long continued feeding of one ration; eating of poisonous vegetable or mineral matter; worms or anything that tends to inflame or irritate the bowels.

SYMPTOMS.—Great general weakness. Bird gets into a corner, or lies down in a listless manner with feathers ruffled. Eyes are nearly closed. The bird is hot, in fact there is general fever. It seems to shiver and is restless. Discharges are watery with mucous, stringy matter, sometimes tinged with bile or blood. It is quite common for fatal cases to show stupor, or wildness when well advanced with the disease.

TREATMENT.—Remove cause. Give teaspoonful of castor oil. Stop feeding hard food or grit for some days. Give mash of stale bread and milk with rice water or boiled milk for drink.

The foregoing description of the ailment is given at length for the benefit of numerous inquirers and others, who are feeding for eggs in winter.

A TRYING MONTH.

The month of March seemed to be the most trying to all the laying stock. It was at that time that the Spanish breeds seemed more predisposed to egg eating and feather picking. This was attributed to the long period of artificial life and treatment, in comparatively limited quarters, and it was so stated in the annual report of 1893. But later observation, the results of which are given in this report, showed that the main cause was not such as was supposed at that time.

It was also noticed that, when the ground was free of snow in spring and the fowls had outside run, all trouble ceased.

CONCLUSIONS ARRIVED AT FROM THE FOREGOING.

The conclusions arrived at from the foregoing experience and that of correspondents are :—

1. That there had been too many and not variety enough in the rations fed during winter.
2. That the warm morning mash had been fed in too liberal quantity, if not too frequently.
3. That more exercise and more green stuff were necessary.
4. That lime for shell should be conveyed, if possible, in the form of a ration, as well as being before the layers in the shape of crushed oyster shells.
5. That it is of paramount importance to have the winter layers over moult early; of the proper age and into winter quarters neither too fat nor too lean.
6. That the handling of the winter layers, so as to have them over their moult early and into winter quarters in proper condition, must begin in summer.

THE REMEDY APPLIED AND WHEN AND HOW.

In the summer and fall of the past three years the handling of the laying stock, so as to procure an early moult, was successfully carried out, as described in the reports of those years. But it was not until the fall of 1896 that it was decided to reduce the number of rations. Accordingly, when the laying stock went into winter quarters in November, 1896, the noon ration was dropped and the morning ration slightly reduced. The rations were then two in number, viz., morning and afternoon, instead of three, a reduction of nearly one-third. The result was nearly one third more eggs. Details are given further on.

The year is dated from the 1st of November of each year named, as winter laying usually begins in that month.

THE MODIFIED RATIONS.—HOW MADE UP.—HOW FED.

The number of layers in the fall of 1896, and to which the modified rations were fed, was 204, composed of 151 hens and 53 pullets. The reduced rations were as follows.

MORNING RATION.

Three mornings of the week, cut green bones ; the other three mornings, a warm mash. The green bones were got from the butcher shops and were cut up by a bone cutting machine, run by power. The mash was composed of shorts, ground oats, ground barley, ground rye, wheat bran, steamed lawn clippings, or steamed clover hay, the latter cut into short lengths. The lawn clippings and clover hay were prepared by placing the quantity thought sufficient, into a pot, containing boiling water, the night previous and allowing it to steam all night. The mash was mixed with boiling water. Sometimes for a change boiled turnips, or small potatoes were mixed into the mash.

On Sunday morning whole grain was usually fed.

NO NOON RATION.

No noon ration was given, but mangels, turnips and cabbage were before the fowls, all the time.

AFTERNOON RATION.

Whole grain, wheat or buckwheat, principally the latter while it lasted. Sometimes oats were mixed with the buckwheat, more frequently so in late spring and early summer.

QUANTITY FED.

The cut green bones were fed in the proportion of one pound to every fifteen hens. The mash in quantities of one quart to every twenty, or twenty-five hens. This may seem a small ration, but reasons for it are given further on. The afternoon meal was 20 pounds of wheat, or buckwheat, to 204 fowls.

WHAT WAS AIMED AT.

The aim in feeding the above rations was :—

1. To avoid an overfat condition.
2. To incite the layers to greater activity.
3. To convey lime for shell in form of cut green bone ration.
4. To furnish a greater quantity of green stuff.
5. To have as much variety in rations as possible.
6. To avoid many of the ills and vicious propensities noted in former years.

HOW OVERFEEDING WAS AVOIDED.

There was no hard and fast rule, as to the frequency with which the cut green bone was fed. When the hens were laying well a little would be fed, perhaps, every morning On such times no mash was used. Immediately after the morning ration a few handsfull of grain were thrown in the litter on the floor of the pens, so as to start the hens busily searching for it. Great care was taken in feeding the mash. Experience has proved that the overfeeding of the morning mash is the rock on which many farmers and poultry keepers are wrecked, in their eagerness to obtain eggs in winter. Experience has proved that disastrous results will surely follow the overfeeding of the morning ration of whatever kind. Particular mention is made of the mash, because it is so generally fed. It must not be inferred that objection is taken to the mash. It is useful and convenient in utilizing the waste of table, kitchen and barn, but it must not be overfed. The object in reducing and limiting the quantity of the soft mash, is to prevent the possibility of gorging the laying stock, at the early meal and so have them disinclined for the exercise, so requisite.

EXERCISE AND HOW BROUGHT ABOUT.

Having had a light morning meal the layers were ready for exercise and this was incited by throwing two or three handsfull of grain—as already stated—in the straw, cut hay, dry leaves or chaff composing the all essential dry litter, to be found on the floor of all well equipped poultry houses. The aim was to keep the layers, for the remainder of the day, so busy searching for the scattered grain, that their crops would be gradually filled by the time they went to roost. Certainly, a more natural way than by rapidly filling their crops with grain thrown on a bare floor, or into a trough. The afternoon grain ration was always fed early, so as to permit of the search being kept up. Too much importance cannot be placed on the exercise part of the winter management.

A POINT TO REMEMBER.

The reason for feeding the morning ration will be at once apparent, from the above. Had the hens been gorged, at the morning ration, they would certainly not have been inclined for exertion.

VARIETY.

Variety in composition of rations and time of feeding them was found beneficial. To have such variety, the cut bones were sometimes given for afternoon ration.

Again, the mash would occasionally be fed at that time. When fed at the latter period, it was followed by a light grain ration, which was scattered in the litter on the floor, to secure the desired exercise.

ONE CONSPICUOUS RESULT.

An early and conspicuous result of the dropping of the noon and reduction of the morning ration was the greatly increased quantity of vegetables and grit eaten. As already stated, vegetables were always before the layers, as were mica chrystal grit and crushed oyster shells.

APPARENT RESULT IN INCREASED EARLY EGG YIELD.

Another apparent beneficial result from the reduced rations, coupled with the early moulting of the layers, was noted in an increased egg yield in the comparatively early winter months of November and December, as shown by the following figures :—

——	1894.	1895.	1896.
November	114	160	568
December	538	943	1,466

The number of hens in each year were :—

1894	185
1895	218
1896	204

It will be noticed that the number of fowls was less in 1894, than in the other two years, but not so great as to make the difference in the number of eggs.

The early and increased results were gratifying because new laid eggs were in great demand, as they usually are in November and December, particularly so at the Christmas season.

COMPARATIVE EGG YIELDS.

The egg yield of the whole year, as compared with that of the three previous years, will best show any beneficial results from the decrease in quantity of food. The year is dated from the beginning of November of one year to the end of October of the year following, for the reason that winter laying has usually begun in November. The figures are as follows :—

November (1893)	90	114	160	568
December (1893)	250	538	943	1,466
January	777	819	1,469	1,540
February	791	1,080	1,411	1,351
March	1,644	1,387	1,569	1,668
April	1,939	1,823	1,934	2,139
May	1,650	1,603	1,699	1,846
June	1,066	1,134	897	1,190
July	941	456	682	859
August	386	438	395	736
September	236	246	143	655
October	161	23	150	339
	8,931	9,661	11,452	14,357

The figures for the months of November and December of 1893 are estimated, as the record book could not be found, but they are not much out of the way.

The table shows a large increase in the output of eggs in the past year as compared with the three previous years. It is also an object lesson to the farmers as showing :—

1. Eggs were most in supply during the period of high prices.

2. During the spring months, of comparatively low prices, there were eggs enough to sell and hatch early chickens from.

3. The male chicks would be valuable as early birds for market. The pullets would be valuable as early layers.

4. That with proper care and feeding fowls will lay well during the winter season.

EGGS LAID PER DAY IN WINTER MONTHS.

The following is the production of eggs per day in the winter months named and the price of eggs during that time :—

DECEMBER, 1896.—38, 36, 31, 39, 43, 29, 40, 41, 45, 42, 42, 42, 42, 48, 47, 46, 50, 47, 52, 54, 57, 45, 54, 55, 55, 45, 64, 60, 52, 68, 55=1466.

JANUARY, 1897.—52, 61, 53, 53, 52, 54, 45, 57, 42, 51, 48, 46, 44, 50, 46, 53, 43, 49, 50, 42, 54, 50, 53, 47, 50, 54, 44, 54, 52, 40, 51=1540.

FEBRUARY.—45, 57, 51, 42, 46, 51, 40, 52. 48, 46, 50, 43, 47, 48, 44, 44, 49, 58, 48, 45, 52, 51, 45, 52, 46, 43, 51, 56=1351.

MARCH.—45, 60, 44, 59, 47, 54, 55, 54, 58, 51, 48, 57, 64, 47, 56, 44, 50, 50, 61, 43, 59, 51, 61, 53, 59, 50, 52, 55, 65, 57, 60=1668.

WHAT THE EGGS WERE SOLD FOR.

Eggs were sold, in Ottawa, from 1st to 15th of December, at 30 cts. per dozen ; during the latter half of that month at 35 cts. per doz. In January at 35 cts. per doz. in Ottawa. A shipment of eggs to Montreal during January brought 40 cts. per doz. The express charge for the case of 18 doz. eggs was 36 cts.

During February continued mild weather brought the price down to 25 cents. March, the prevailing price was 20 cts. per doz., declining to 18 cts. per doz.

COST OF DAILY RATIONS.

The cost of the daily rations fed to the laying stock, numbering 204, was estimated at 41 cts., as follows :—

18 lbs. of cut green bone at 1 ct. per lb.	18
20 " wheat, buckwheat, &c., at 1 ct. per lb.	20
Grit and vegetables	3
	41 cts.

To this should be added the time of the man in cutting up the bones by the machine, sometimes half or three quarters of an hour. It should also be stated that buckwheat was mostly used for cut rations during the winter months. To offset this is to be considered the worth of the manure, which a bulletin from the Raleigh, North Carolina, Experimental Station values at half the cost of the feed of the hen for the year, but which we allow to go for the trouble of the farmer in looking after and feeding his fowls.

When mash was fed it was composed of ground grains, in such quantity as not to exceed the value of 18 cts.

The allowance of 1 cent per lb. for the whole grain is liberal, for buckwheat sold in the fall and early part of the winter at 22 and 25 cts. per bushel.

EGGS SOLD AT THE HIGHEST PRICES.

Having obtained the new-laid eggs in the season of highest prices, the aim was to dispose of them to the best possible advantage. With a little effort the best results were obtained. The following is an instance :—

On the 30th of December, as shown in the above table, the greatest number of eggs laid on any day, in that month, was collected, viz.: five dozen and eight (68). These eggs were disposed of at the following prices :—

5 doz. and 8 eggs at 35 cts. per doz	$1 97
Deduct cost of rations	0 41
Proceeds of that day	$1 56

But as that was the day of the greatest production, it is but fair to give the average of the month, which was 48, or four dozen per day.

4 doz. eggs at average price of 33 cts. per doz.	$1 32
Deduct cost of rations	0 41
	$0 91

The eggs were strictly fresh and were sold in the city of Ottawa. In the same month eggs of the same description were worth in Montreal from ten to fifteen cents more per dozen. Had the eggs been sent to a leading grocer of that city they would probably have made the larger figure, less express charges.

LESSONS FROM THE ABOVE.

The lesson to the farmer is to obtain the new laid eggs in the winter season of high prices and having got the eggs to sell them—while they are strictly new laid—to leading grocers, dairymen, &c., or choice customers, who will always pay the high price for a reliable article. It may be said that the high figures named are not received by the majority of farmers. Perhaps not by farmers, who, are a distance from a high price market and who have to sell to a middleman. Certainly not by those who do not bring in a strictly new laid article. But the high figures are certainly received by farmers who cater to the requirements of a high price market, with strictly fresh eggs and a superior quality of poultry.

SUMMARY OF RESULTS NOTED.

The following is a summary of beneficial results noted, as following the reduction of the rations, with the care and handling of the laying stock, as described :—

1. Better health of the laying stock.
2. Greater output of eggs.
3. No development of vicious habits of previous years.
4. Comparatively few eggs laid with thin shells and none with soft shells.
5. Much greater activity of the layers in searching for the grain scattered in litter on the floor.
6. Much better condition of the fowls, of all breeds, in February and March as compared with previous years.

EXPERIENCE REQUIRED.

The question may be asked, "Why was the disastrous results of overfeeding not discovered before?" The reply is that it requires several years of experience and careful observation before reliable data can be obtained. There were many statements made and read during the past few years but none had received confirmation by experiment. The management and feeding of his hens by the farmer, so as to obtain eggs in paying quantity from them in winter, is comparatively new and much is yet to be learned. The report of the poultry department for any year gives the experience of that year, which that of the following year may confirm or modify, and so the work goes on and all in the way of finding out cheaper and more effective rations.

BREEDING PENS MADE UP.

At the beginning of March the breeding pens were made up as follows :—

Date.	Breed.	How Mated.	Remarks.
March 2	Barred Plymouth Rocks	1 cock 9 hens	
" 2	White "	1 " 8 "	
" 2	Silver Laced Wyandottes	1 cockerel 9 "	
" 2	Light Brahmas	1 cock 7 "	
" 2	Black Minorcas	1 " 9 "	
" 2	White "	1 " 8 "	
" 2	Andalusians	1 " 9 "	
" 2	Coloured Dorkings	1 " 8 "	
" 2	Houdans	1 " 3 "	
" 2	Black Minorcas	1 cockerel 4 "	Second pen.
" 11	White Leghorns	1 " 11 "	
" 11	White Wyandottes	1 " 7 "	
" 11	White Plymouth Rocks	1 cock 3 pullets	Second pen.
" 13	Langshans	1 cockerel 9 hens	

The eggs most in demand for setting were those of Barred and White Plymouth Rocks, Black Minorcas, Silver Laced Wyandottes and White Javas, in the order named. There was a greater demand for eggs of the Barred Plymouth Rocks than could be filled. It is gratifying to note that the popularity of this breed is steadily increasing. It is certainly good for both egg production and flesh development. Of equal merit is the Wyandotte family with its varieties of Silver Laced, White, Black, Golden and Buff. As prolific layers of large white eggs the Black Minorcas have taken a front place, and deservedly so.

HOW THE EGGS WERE SET.

The eggs were set in specially prepared nests, placed in a portion of the poultry house set apart for the purpose. In close proximity to the sitters was their food, composed of mixed grains, grit, water and dust bath. The mixed grains were contained in a narrow trough. For early sitters Wyandottes were preferred, as being docile, easily handled and not clumsy. Some of the cross bred hens were found to make excellent sitters and mothers. On being made, the nest was dusted with carbolic disinfecting powder, and so was the body of the sitter, before being placed on the nest.

AN EARLY HATCH.

At the beginning of February a vigorous male of the same breed, which had been kept in a separate compartment, was mated with a certain number of Barred Plymouth Rock hens. The object was to test the fertility of the eggs from hens which had been laying all winter. On the 20th of the month named, 13 eggs were given to a hen which had become broody. Three weeks after 11 lively chicks hatched out. The twelfth egg contained a dead chick, fully developed. The thirteenth egg was unfertile. Such a result from Plymouth Rock hens which had laid from the previous November was most gratifying. It went to show that it was quite possible to have hens lay all winter and to have early fertile eggs from them. The subsequent care and trouble experienced in rearing the chicks, went to show that it would not be profitable for a farmer to hatch out and rear chickens at that early period, unless he had a brooder or brooding room.

That the farmers in the neighbourhood of city markets, or within easy reach, by rail, of the same, are giving greater attention to the artificial rearing and hatching of chickens, is shown by the numerous inquiries by correspondents for information on the subject. Early chickens command a high price, and the demand for them increases year by year.

Further experiments in the way of testing the early fertility of eggs, from hens which have laid steadily all winter, will be important and interesting.

Certain poultrymen keep hens to lay eggs in the latter part of December, January, February and March, for incubator use only. These men live where climatic conditions make it comparatively easy so to do. But where the laying stock are confined to limited quarters from November to the following April, artificially housed and treated meanwhile, skill and experience are necessary to ensure early fertile eggs.

EGGS SET AND CHICKENS HATCHED.

When Set.	Description of Eggs.	When Hatched.	Chickens Hatched.
Feb. 20	13 B. P. Rock	Mar. 11	11
April 12	11 Light Brahma	May 3	3
" 12	11 Andalusian	" 3	4
" 14	13 B. P. Rock (from a farmer)	" 3	10
" 14	13 Langshan	" 5	2
" 14	13 White Minorca	" 5	9
" 14	13 R. C. B. Minorca (from Nova Scotia)	" 5	5
" 14	13 W. Wyandotte	" 5	5
" 14	13 W. P. Rock (from Hazeldean)	" 5	5
" 15	13 R. C. B. Minorca (from Nova Scotia)	" 6	3
" 17	13 B. P. Rock (from a farmer)	" 8	9
" 21	13 "	" 12	13
" 23	13 Brown Leghorn	" 14	10
" 30	13 Coloured Dorking	" 21	7
" 30	13 White Leghorn	" 21	4
" 30	13 White Java	" 21	4
May 5	12 Andalusian	" 26	4
" 5	12 W. Leghorn	" 26	7
" 7	13 Light Brahma	" 28	6
" 8	13 Andalusian	" 28	2
" 10	13 B. P. Rock	" 31	10
" 12	13 Andalusian	June 2	8
" 13	13 Coloured Dorking	" 3	5
" 13	13 White Java	" 3	8
" 22	13 Buff Leghorn (from Toronto)	" 12	1
" 23	13 S. L. Wyandotte	" 13	10
" 23	13 Coloured Dorking	" 13	2
" 27	13 W. Leghorn	" 17	9
" 27	13 "	" 17	11
June 3	13 B. Minorcas	" 24	9
			196

Many of the small hatches were the result of bad sitters. The experience with sitting hens, from year to year, is a varied and not altogether a happy one. During the early part of the season the Langshan cock, a very fine bird, sickened and notwithstanding treatment died. Later in the season the Andalusian cock also died. The latter was replaced by a younger bird. In both cases the want of fertility of the Langshan and Andalusian eggs may be attributed to the lack of condition, on the part of the male birds, prior to apparent symptoms of sickness. In the case of the Andalusian death was comparatively sudden. The Dorking cock was an old, but very fine bird. Some of his progeny are of more than ordinary worth. It will be seen from the above that the eggs which gave the best hatching results were from the Barred Plymouth Rocks, Silver Wyandottes and White Leghorns, notwithstanding that the hens of these breeds were the earliest and steadiest layers. The chickens hatched were strong and vigorous.

GROWTH OF THE CHICKENS.

The progress of the chicks was most satisfactory. After remaining in their nests until thoroughly ripe, with the mother hen they were placed in coops arranged in a field of short grass and clover. Their first food was stale bread, soaked in milk and squeezed dry. A little at a time was fed. Granulated oatmeal, or rolled oats was added on the second or third day. The food was placed on clean boards and none was allowed to remain to sour. Care was taken that the chickens were not overfed, which bad practice leads to much disaster. Grain was not fed until the twelfth or fourteenth day. Milk, at times, and pure water always, furnished all the drink required. As soon as the chicks were firmly on their legs, a mash made of cornmeal, shorts, oatmeal, &c., with a small quantity of blood meal added and the whole mixed with boiling water, or milk, or both was fed in moderate quantity and much relished. As in previous years the most rapid flesh development was made by Barred Plymouth Rock, Wyandotte, Java and Brahma cockerels. Without any forcing, other than regular feeding of wholesome food, in proper quantity and constant supply of pure water, there has never been any difficulty in having chickens of the breeds named weigh 4 pounds each, or 8 pounds per pair, at end of four months. In all cases such results were not attained, but would doubtless have been secured had the chicks been penned and fattened.

For instance a Barred Plymouth Rock cockerel was caught and sent away to a purchaser on the 26th October. It was hatched on the 11th March and when shipped weighed 7 pounds 5 ounces.

A Light Brahma Cockerel, hatched on 3rd May, weighed on 2nd November when it was shipped, 6 lbs 12 ozs.

A Barred Plymouth Rock cockerel, killed on the 17th of November, weighed after being bled and plucked 6 pounds 4 ounces. A pair of such chickens would have made weight of 12 pounds 8 ounces and would have been quickly bought by any leading dealer in Montreal, at 10 cents per pound, or $1.20 per pair. The farmer should aim to breed such chickens and he can easily do so, by keeping one of the breeds which make flesh development as mentioned above. A superior quality of poultry is in great demand in our leading cities, for home consumption, and export to the British market.

BEGINNING OF WINTER LAYING.

The fowls went into winter quarters in the second week of November. Winter laying may be said to have commenced about the 20th of the month. The first hens to resume laying were Plymouth Rocks, White Leghorns, Andalusians.

WHEN THE PULLETS BEGAN TO LAY.

The Plymouth Rock pullets hatched on the 11th March, three in number, matured early. The first egg laid, by one of their number, was on 20th September. The others laid soon after and continued to do so, up to time of writing, 26th November. The

moral is obvious. The early pullets begin to lay when the price of new laid eggs is becoming high. It is therefore an object to have early hatched pullets. The White Leghorn pullets, hatched at end of May, began to lay in the beginning of November.

WILD AND TAME GEESE.

In the spring a tame gander was mated with one of the wild geese and a wild gander with a tame goose The object was to obtain progeny from the cross. The limited quarters were evidently not suitable, for no results followed. The wild goose laid her usual quota of six eggs but hatched no offspring. The wild goose mated with the tame gander died during the early part of the summer. At the end of the season the second wild goose died. Both birds were twelve years of age, but were apparently in fair condition prior to death. It is evident that the wild fowl of this breed must have range and congenial surroundings to ensure fertile eggs. The cross of wild and tame geese is not uncommon, but in all cases the birds have had free range. While at Summerside, P.E.I., in September last. the writer was shown a large flock of geese, crosses of the wild and tame. The wild ganders did not attempt to leave the others, although all had unlimited range. The cross birds were large and plump and were sold at $2 each, when killed and sent to the Boston market.

STOCK ON HAND.

The stock in the poultry houses at present are :—

——	Cocks.	Hens.	Cockerels.	Pullets.
Barred Plymouth Rocks	1	12	2	28
White do	1	9	....	4
Silver Laced Wyandottes	2	13	4	5
White Wyandottes	1	11	....	3
Light Brahmas	1	9	3	3
Langshans	....	7	....	....
White Javas	1	8	7	4
Coloured Dorkings	....	7	3	4
White Leghorns	2	20	7	17
Brown do	....	....	1	3
Black Minorcas	1	7	11	4
White do	1	3	5	2
Andalusians	....	9	4	....
Golden Polands	2	2	.. ..	....
Mixed hens	......	26	....	....
	13	143	47	77

DISEASES OF POULTRY.

During the year several letters were received describing symptoms of different diseases. Two of the communications came from a distance and described symptoms of diseases unknown in this country. Where diseases were recognized, the best known treament was recommended.

THE PROFITS MADE BY FIFTY HENS.

The following experiment was conducted at the request of the House of Commons Agricultural and Colonization Committee. It will no doubt be interesting to farmers who cannot keep more than fifty hens. It shows the profit made by the number of fowls named and the manner in which they were managed and fed. The experiment

began on the 1st of April, 1896, and continued for one year. The hens selected were :—

Silver Laced Wyandottes	9
White Javas	7
Mixed, or common hens	34
	50

None of the fowls selected were over two years. The object in making the above selection was to have :—

1. Stock of the age to make good winter layers.
2. To have a certain number of thoroughbreds so as to permit comparison with the mixed hens.
3. A certain number of thoroughbreds, from which male birds could be raised to sell for market or breeding purposes, the pullets being retained for layers.

EGGS LAID.

The eggs laid by the fifty hens during the year were as follows :—

April	571
May	540
June	317
July	242
August	155
September	61
October	77
November	344
December	587
January	693
February	600
March	586
Total	4,773

As stated in foregoing part of report, the object was to get the eggs when they were worth most and to sell them at the best price obtainable. Receipts and expenses were as follows :—

RECEIPTS.

Eggs sold for eating purposes at prices of from 13 to 35 cents per dozen	$ 78 69
Sold for hatching purposes	41 50
11 Cockerels sold at $1 each, viz.: 9 Silver Laced Wyandottes and 2 White Javas	11 00
8 Silver Laced Wyandotte pullets on hand in the fall, at $1 each	8 00
Total	139 19

EXPENDITURE.

Deduct cost of food for the year	$ 40 26
do rearing 19 chickens	5 00
	45 26
Profit	$ 93 93

The cost of rearing the 19 chickens is put at the highest figure. It is based on the calculation that the food of the hen costs 75 cents per annum. In this way, 75 × 8 give \$6. The half of \$6 = \$3, for raising 6 pullets to six months of age. \$2 are allowed to raise 11 Cockerels to marketable age, viz., four months.

THE PRICES OBTAINED FOR EGGS.

April, May, June, July, 95 doz. at 12 to 15 cents a doz....	$	11 46
August, 13 doz. at 13 cents..................		1 69
September, 5 doz. at 20 cents..................... ..		1 00
October, 6½ doz. at 20 cents..........................		1 30
November, 29 doz. at 25 cents.........................		7 25
December, 49 doz. at 32 cents, average price		15 68
January, 58 doz. at 33 cents..........................		19 14
February, 50 doz. at 25 cents...		12 50
March, 48 doz. and 2 eggs at 18 cents		8 67
41½ settings sold for hatching at \$1 each..............		41 50
11 Cockerels, viz. : 9 Silver Laced Wyandottes, and 2 White Javas, at \$1 each..........................		11 00
8 Silver Laced Wyandotte pullets, at \$1 each............		8 00
	$	139 19

DEDUCT.

Feed for the year...........................	\$40 26	
Cost of raising 11 Cockerels to marketable age, and pullets to laying age......................	5 00	
		45 26
Net profit..............		\$93 93

DETAILS OF FEED BILL.

The cost of feed was made up as follows :—

Wheat, 1,882 lbs. at 1c per pound.....................	$	18 82
Oats, 244 lbs. at 1c. per lb..........................		2 44
Buckwheat, 281 lbs. at 1c. per lb		2 81
Barley, 10 lbs. at 1c. per lb.........................		0 10
Mash (ground grains), 440 lbs. at 1c. per lb............		4 40
Cut green bone, 244 lbs. at 1c. per lb..................		2 44
Cooked refuse meat, 394 lbs. at 1½c. per lb......		5 91
Blood meal, 8 lbs. 7 ozs. at 4c. per lb..................		0 34
Vegetables and grit..................................		3 00
Total		\$40 26

The allowance of one cent per pound for all the whole grain food was a liberal one. Indeed more than it was worth to a farmer.

THE PROFIT MADE.

The calculation given in a preceding page shows the profit made as \$93.93, but reducing the cost of rearing the chickens and the value of the grain to farmers figure, the profit is very nearly, if not fully, \$2 per head.

COST OF DAILY RATION.

The daily ration and cost were as follows :—

3½ lbs. cut bone at 1c.	3½
5 lbs. wheat or buckwheat, at 1c.	5
Grit and vegetables, say	1½
Total	10

PRODUCTION PER DIEM AND PRICES OBTAINED.

The following figures show the output of eggs per day by the 50 hens for December, January, February and March, period of high prices :—

December.—18, 16, 14, 18, 21, 13, 17, 16, 19, 18, 17, 14, 18, 20, 18, 19, 16, 18, 15, 19, 17, 22, 20, 23, 24, 18, 20, 27, 21, 28, 23 = 587. In this month eggs retailed at 30 and 35 cents per dozen in Ottawa.

January.—21, 27, 25, 18, 25, 23, 18, 26, 21, 23, 24, 21, 20, 23, 23, 25, 21, 25, 23, 20, 22, 20, 22, 22, 21, 22, 21, 26, 24, 19, 22 = 693. Eggs sold at 30 and 35 cents. Eighteen dozen sent to Montreal fetched 40 cents per dozen.

February.—22, 27, 23, 20, 24, 23, 19, 23, 19, 22, 20, 15, 23, 19, 18, 15, 25, 25, 20, 22, 23, 21, 20, 25, 17, 23, 23, 24 = 600. Eggs sold at 25 cents per dozen.

March.—20, 24, 18, 25, 18, 25, 23, 21, 23, 22, 19, 26, 19, 20, 14, 18, 11, 20, 15, 13, 12, 15, 14, 18, 18, 17, 17, 20, 20, 19, 22 = 586. Eggs sold at 18 cents.

From the above it will be seen how much profit was made during the winter months named, with cost of production at no more than ten cents per diem.

EGGS LAID BY THE DIFFERENT BREEDS.

The following will show the number of eggs laid by the different breeds :—

	April.	May.	June.	November.	December.	January	February.	March.	Total.
9 Silver Laced Wyandotte hens.	87	78	63	48	172	169	154	121	892
7 White Java hens	122	112	59	14	19	(replaced on 22nd December by 11 Silver Laced Wyandotte pullets.)			326
11 Silver Laced Wyandotte pullets	....	.....	.....	....	51	160	134	114	459
Mixed hens	233	209	142	52	191	198	169	206	1,400
11 Plymouth Rock and Dorking Cross hens	129	141	53	59	154	166	143	145	990
(Eggs laid by all hens when running at large during months of July, August, September and October)									706
Total									4,773

COST OF PRODUCTION IN SUMMER.

Exception may be taken to the high figures obtained for the eggs sold in the winter months. The following statement made to the committee will show that fifty hens, running at large, in the summer season of low prices, should not cost the farmer more than four cents per day :—

"Not many days ago a farmer visited me, and I put the case to him in this way. I said : We reduced the cost of rations of fifty hens, during last winter, to ten cents per day. On these rations they laid well and were in perfect health. My opinion is that with the laying stock running at large—as they do in most cases—the cost of the fifty

hens per day to a farmer could be reduced to five cents, if not to four cents. I calculated, that as prices go, four cents would buy five pounds of sound grain, say buckwheat and oats mixed, or wheat and oats. I would give half of the quantity in the morning, and the remainder for evening ration. Meanwhile the hens have had opportunity to find insect life, grit and green stuff, and would return with their crops well filled, and the 2½ pounds of grain would be quite enough for them. He said that under the circumstances he did not think the cost would be any more. I further explained that my object was to show that the production of a dozen eggs, in such a case, should not cost more than four cents, and that a greater number would likely be laid by the fifty hens, during the day. Speaking on the subject to a friend who lives in the neighbourhood of the city limits, and who successfully manages a flock of Barred Plymouth Rocks, he remarked that he thought he was doing something very like what I stated. I asked him to give me his figures, and he did so in the following letter which I submit to you :—

OTTAWA, June 8, 1897.

Mr. A. G. GILBERT,
Experimental Farm.

DEAR SIR,—My answer to your question, "How much does it cost me per dozen to produce eggs in the summer months?" is—two and a half cents. I find that twenty of my hens (Barred Plymouth Rocks) will lay an average of one dozen a day from 1st of March until 1st of September, on the following rations :—

1½ pounds of shorts, mixed with cooked vegetables, in the morning, 1½ cents ;

2 pounds of buckwheat in the evening, at 25 cents per bushel, 1 cent.

Making together 2½ cents.

The vegetables used are culls, of no market value, and when not available, skimmed milk is used to moisten the meal. My hens are at liberty to forage about the pastures and yards, and the abundant supply of worms, grubs and insects make up any deficiency that I do not supply.

Yours sincerely,
S. SHORT.

I would not use skim-milk as Mr. Short does, because skim-milk with us is, to a certain extent, costly. I consider such a letter important. It goes to confirm my point and to show farmers that no matter how low prices of eggs have been, there yet remained a margin of profit.

REPORT OF THE FOREMAN OF FORESTRY.

(W. T. MACOUN.)

DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I beg to submit, herewith, my fourth annual report as Foreman of Forestry in which will be found information relating to the forest belts at the Central Experimental Farm; the arboretum and progress of the work there; the planting of ornamental trees and shrubs with a list of one hundred of the hardiest and most ornamental species and varieties; information relating to the growing of perennials, with a list of one hundred of the best species and varieties; hints on hedge planting with a list of the hedges growing at the farm; and notes on the condition of, and work in connection with, the ornamental grounds.

I have the honour to be, sir,
Your obedient servant,

W. T. MACOUN.

It is not often that two such trying winters as the past have been, follow one another so closely. Both were characterized by lack of snow, very severe frosts, with intervals of mild weather, and generally unfavourable conditions for the wintering of trees, shrubs, and plants. It was feared that many losses would be discovered in the spring of 1897, especially when it was remembered what a rigorous winter the trees and shrubs had experienced, but, when growth commenced, it was found that the proportion of deaths was little above the average, and in many cases, partly tender species were not killed back so much as in former years. The early part of April was mild, but during the third week of that month the weather became quite cold, the temperature falling on the 19th and 20th to seventeen and nineteen degrees below freezing, which checked the swelling buds for a time. Very cool weather, with frost at nights during the third week of May, no doubt injured the buds on some of the earlier flowering shrubs which did not make as fine a show as in some seasons. The summer was dry and the trees and shrubs did not all have that robust appearance, nor make as vigorous a growth, as in other years. The last week of July, however, was very wet, the almost continuous downpour of warm rain causing many of the trees to make a second growth. September and October were two of the driest months recorded in Ottawa for many years. The drought coming at a time when growth had ceased, no apparent harm was done the trees and shrubs, and it is hoped that the wood of tender sorts, having had such favourable conditions for ripening, will be enabled to withstand the winter better.

TREE PLANTING

Some of the farmers in the more thickly settled parts of Ontario are beginning to feel the need of convenient forests from which they may obtain wood for their constant needs. The timbered land remaining on their own farms has, in many cases, become so depleted through careless management that the supply available does not now meet the demands made upon it. As a result of this the farmer is often obliged to go some distance to get the material he desires. The time has now come when it behooves the owner of a farm to consider the value of the wood crop as well as that of his grain or other crops.

Where timber lands still remain on the farm they should be properly cared for so that they may continue to yield supplies of fuel. It is the custom with many farmers when grass has become scarce during the summer months to let their cattle pasture in the woods; the result is that the young seedling trees are destroyed, which, if protected, would grow up to replace those which are cut down. This practice should be avoided, if possible. Furthermore, in cutting his trees for fuel the farmer frequently takes those which are in their prime and leaves the largest and partly decayed, which are more difficult to handle. It would be wiser to fell the oldest and most matured trees first and follow with those remaining in the order of their size and age. Judicious cutting is very essential to permanency of the wood supply. Too much care cannot be taken, also, in felling the trees, for if this is done carelessly many young trees will be destroyed. A forest cover, more or less perfect, should also be encouraged, and those favourable conditions of moisture maintained which trees require to produce the most vigorous growth.

Where there is no woodland on the farm, such portions as are too poor to yield good crops, or hillsides that may be inconvenient to cultivate, may be turned with good advantage into a forest if proper measures are promptly taken to plant these areas with trees. Where all the soil is good and there are no hillsides, a belt of trees could be planted along the northern and western sides of the farm, which, while they would serve the purpose of windbreaks, would also become in time valuable for fuel or timber.

FOREST BELTS AT THE CENTRAL EXPERIMENTAL FARM.

The forest belts at the Central Experimental Farm extend along its northern and western boundaries; the belt on the western boundary is 165 feet wide, and that on the northern boundary, 65 feet; their total length being nearly $1\frac{3}{4}$ miles. The number of trees growing in these belts, including those in an evergreen clump, is about 20,500. The objects, for which these forest belts were planted, are well expressed in the report of the director for 1893 as follows:—

"There were several objects in view in planting the belts of forest trees which line the west and north sides of the farm. One was to test by actual experiment with a number of different species the comparative results in growth and development to be had by planting at different distances apart. Five feet by five, five feet by ten and ten feet by ten were the distances chosen for these tests. Another question on which information was desired was the relative growth to which trees would attain when planted in blocks of single species as compared with those planted in mixed clumps where they are associated with a number of other sorts. Further information was sought as to how far the crops on the farm located near these tree belts will be influenced by the shelter they would afford as growth progressed. In the planting, the grouping was also designed with the object of producing pleasing effects on the landscape by the intermingling and blending of varieties. The main purpose, however, was to get all the useful data possible with regard to the more important timber trees of economic value so that object lessons in tree growth might be available to any who in future might desire to study this subject or to engage in the enterprise of timber growing."

Although it is but nine years since the first trees were planted in the belts referred to, the growth already made is a useful object lesson and should encourage the more

View in Forest Belt at Central Experimental Farm, Ottawa, July, 1897, showing Black Walnut planted in spring of 1889, five by five feet apart, when two years old.

View in Forest Belt at Central Experimental Farm, Ottawa, July, 1897, showing White Pine planted in spring of 1889, when eight to ten inches high, five by five feet apart.

extensive planting of timber trees. The soil in which the trees were planted was in many instances poor, and while a number of species appear to succeed almost as well on poor as on good land, yet some kinds require good soil in order to grow them successfully. As to the distance apart at which it is desirable that trees should be planted, those which were put five by five feet apart are making, in most cases, the best trees for timber purposes, as the lower limbs are dying, leaving the trunks clean which will make the wood freer from knots than where planted ten by ten, or ten by five feet apart as at those distances there are, as yet, few instances where the lower limbs have died. The trees planted five by five feet apart, also make make more growth in height than where wider planting was adopted, but the diameter of the trunk is not so great. The closely planted trees are more protected from storms and there are fewer broken tops and crooked stems. The desirability of close planting is also very apparent in the condition of the surface of the ground where the trees are ten feet apart, which, in a number of cases, still requires cultivation although the trees have been planted for eight years, which is necessary in order to keep sod from forming and checking the growth of the trees, whereas, in most instances where the trees are planted five by five feet apart the surface soil is kept shaded and moist, and sod does not form. As the conditions of soil are different in the belts where the trees are planted in clumps of a single species and where the several kinds are mixed together, a fair comparison of these two methods of planting cannot yet be made, but the advantages derived from mixing the leafier sorts of trees with those which are not very leafy, are already apparent. Where thin foliaged trees have been planted five by five feet apart and have had eight years' growth, the sod still forms very readily unless the soil is kept cultivated, thus showing that sufficient shade is not afforded to prevent the growth of grass and weeds.

The black walnut (*Juglans nigra*) does not succeed well on all kinds of soils. Unfortunately most of that in the forest belts at the Central Experimental Farm is not very suitable for this tree, although in some places they are doing well. Those which were planted in a cold, compact, light sandy loam are almost at a standstill; in a warmer light sandy loam with gravel they are doing much better, but not making thoroughly satisfactory growth, while in the mixed belt, where the soil is a rather stiff clay loam, they are doing best. By consulting the table the growth of this tree in these different kinds of soil will be found.

The white pine (*Pinus Strobus*) has made very satisfactory growth in the belts. This is due, undoubtedly, in a large measure, to the fact that the soil chosen for this test proved suitable for them, being a warm, light, sandy, loam. On gravelly soil they have also done well. This pine makes a very rapid growth, and young trees planted in the spring of 1889, when 8 to 10 inches high, now average about 15 feet in height, with a diameter one foot from the ground of from 3 to 4 inches.

The European larch (*Larix europaea*) is also a very rapid growing tree, and seems to do equally as well on a warm sandy loam; a cold, compact, light, sandy loam, and a clay loam. The trees, in the plantation in the forest belt growing in a cold compact sandy loam, are now from 19 to 22 feet in height, with a diameter, one foot from the ground, of from 4 to 5 inches.

The white ash (*Fraxinus americana*) planted in 1889 and growing in a black loam have made very rapid growth and are now about 20 feet in height, with a diameter one foot from the ground of 3 inches. The black, green, and red ash, in the same soil, have made slower growth.

The Scotch pine (*Pinus sylvestris*) does well on a clay loam, a gravelly soil, a warm sandy loam, and a cold compact sandy loam. Planted in 1888 on a cold sandy loam when 18 inches high, they are now 16 feet in height, with a diameter one foot from the ground of 4 to 5 inches.

The canoe birch (*Betula papyrifera*) planted in 1889 in a light sandy loam soil have made rapid growth and are now from 23 to 26 feet in height and 3 to 5 inches in diameter. The branches of this tree have already died, where the trees are planted five by five feet apart, to a height of 8 feet.

GROWTH of Trees in the Forest Belts

Name of Species.	Character of Soil.	When Planted.	Distance Apart.	Age or Height when Planted.
			feet.	
Black Walnut—Juglans nigra	Low sandy loam	1888	5 x 5	1 year
do do	do	1888	10 x 10	1 do
do do	Sandy loam with small stones.	1889	5 x 5	2 do
do do	do do	1889	10 x 10	2 do
do do	Clay loam	1888	10 x 5	1 do
Butternut—Juglans cinerea	Low sandy loam	1888	5 x 5	1 do
do do	do	1888	10 x 10	1 do
Silver-leaved Maple—Acer dasycarpum	Light sandy loam	1889	5 x 5	3 do
do do	do	1889	10 x 10	3 do
European White Birch—Betula alba	do	1889	5 x 5	3 do
do do	do	1889	10 x 10	3 do
Canoe Birch—Betula papyrifera	do	1889	5 x 5	3 do
do do	do	1889	10 x 10	3 do
Yellow Birch—Betula lutea	do	1889	5 x 5	3 do
do do	do	1889	10 x 10	3 do
White Elm—Ulmus americana	Sandy loam	1889	5 x 5	3 do
do do	do	1889	10 x 10	3 do
Black Ash—Fraxinus sambucifolia	Black muck	1889	5 x 5	2 do
do do	Low sandy loam	1889	10 x 10	2 do
Green Ash—Fraxinus viridis	Black muck	1889	5 x 5	3 do
do do	Low sandy loam	1889	10 x 10	3 do
Red Ash—Fraxinus pubescens	Black muck	1889	5 x 5	2 do
do do	Light sandy loam	1889	10 x 10	2 do
White Ash—Fraxinus americana	Black muck	1889	5 x 5	3 do
do do	Light sandy loam	1889	10 x 10	3 do
Black Cherry—Prunus serotina	Light sandy loam and gravel.	1889	5 x 5	3 do
do do	do do	1889	10 x 10	3 do
Box Elder—Negundo aceroides	Light sandy loam	1889	5 x 5	2 do
Bolle's Poplar—Populus alba Bolleana	do	1890	5 x 5	1 do
do do	do	1890	10 x 10	1 do
Scotch Pine—Pinus sylvestris	Sandy loam with gravel	1888	5 x 5	18 inches.
do do	do do	1888	10 x 10	18 do
do do	Low sandy loam with gravel.	1888	5 x 5	18 do
do do	Low sandy loam	1888	10 x 10	18 do
do do	Light sandy loam	1888	10 x 5	18 do
do do	Clay loam	1888	10 x 5	18 do
do do	Light sandy loam and gravel.	1888	10 x 5	18 do
do do	do do	1887	3 x 3	9 do
Austrian Pine—Pinus austriaca	Light sandy loam	1889	5 x 5	18 do
do do	do	1889	10 x 10	18 do
do do	do	1888	10 x 5	15 do
do do	Clay loam	1888	10 x 5	15 do
do do	Light sandy loam and gravel.	1888	10 x 5	15 do
do do	do do	1887	3 x 3	15 do
White Spruce—Picea alba	Light sandy loam	1889	5 x 5	15 do
do do	do	1889	10 x 10	15 do
Norway Spruce—Picea excelsa	do	1889	5 x 5	18 do
do do	do	1889	10 x 10	18 do
do do	do	1888	10 x 5	15 do
do do	Clay loam	1888	10 x 5	15 do
American Arbor-vitæ—Thuya occidentalis	Low sandy loam and black muck.	1889	5 x 5	18 do
do do	Low sandy loam	1889	10 x 10	18 do
European Larch—Larix europæa	do	1888	5 x 5	2 feet
do do	do	1888	10 x 10	2 do
White Pine—Pinus Strobus	Light sandy loam with gravel.	1889	5 x 5	8 to 10 in.
do do	do do	1889	10 x 10	8 to 10 in.

In the above table the average growth is given of most of the important timber trees growing in the measurement of average trees, and give a fairly accurate idea of the growth these make each year. Until spread so much that it was difficult to determine the leader, hence the total height is now taken. This are very divergent, or the extremities pendulous. the total height is given as less than that of the year

at the Central Experimental Farm.

Average Height, Autumn of						Average Growth in						Average Circumference 1 Foot from Ground.			
1895.		1896.		1897.		1892.	1893.	1894.	1895.	1896.	1897.	1893.	1895.	1896.	1897.
ft.	in.	ft.	in.	ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
9	11½	10	6	10	9	26	23	21	18	6	3	5⅓	7⅔	8 7/24	8½
5	5	5	8½	5	10½	12	17½	11	9	3½	2	3	5	5½	5 17/24
12	8	13	9	14	5	37½	28	36	19	13	8	.....	8½	9 13/24	9 19/24
8	4½	8	7½	8	12½	15	25	28	15	3	5	......	7¾	8⅙	8¾
12	5	13	2	13	5	31	31	31	15½	9	3	.....	10¾	11 1/12	12 23/48
9	11	10	7	10	10	19	24	18	10½	8	3	.....	6½	7 1/24	7½
6	2½	6	9	7	4	18	15	15	16	7	7	....	4⅔	6⅙	6⅝
23	2	24	4	25	3	37	40	33	29	14	11	......	9¼	9½	9⅔
22	6	23	1	23	7	53	38	33	20½	7	6	......	13	13⅔	14⅓
23	1	25	4	28	8	58	18	17	14	27	40	....	10⅓	11 17/24	12⅝
24	11	26	7	31	1	36	32	30	30	20	54	...	15⅝	17 5/36	19 4/9
21	9	23	7	25	10	46	36	22	14	22	27	......	9⅔	10	10 5/12
21	2	23	5	25	7	34	24	33	28	27	26	..	13	14¼	15 1/12
16	6	17	1	18	6	47	30	35½	21	7	17	6¾	8¼	9⅛	9⅝
16	1	16	7	18	1	41	33	26	21	6	18	8	11½	12⅔	13 11/24
14	5	14	4	15	1	33	38	27½	23	0	9	5½	6⅔	7⅓	7⅔
13	9	14		14	9	44	31	25	18	3	9	6	9	9⅚	10 7/12
12		12	11	13	11	38	26	32	8	11	12	5	6¼	6 19/24	7 13/24
8	4	9	3	9	1	20	23	19	8	11	0	3½	5	5 11/24	5⅔
15		15	11	17	7	30	31	29	20	11	20	6¼	7⅔	8⅚	9 5/12
14	3	15	5	15	7	28	24	21½	21	14	3	7¼	8½	9⅓	9¾
15	5	16	11	18	4	31	34	39	33	18	17	5	7	8 7/24	8 23/24
12	5	13	8	14	5½	26	32	27½	21	15	9	4⅓	6¼	7⅓	7 17/24
18	5	20	8	22	3	32	41	58	36	27	19	5¼	7	8 1/24	8 11/24
15	9	17	9	19	7	38	38	37	25	24	22	5¾	8⅔	[illegible]	10 13/24
16	7	17	4	18	4	29	21	22	19	9	12	.....	8½	9¼	9 15/24
18	2	19	4	21	2	40	39	32	26	17	20	....	11⅓	11⅙	11 11/12
19	1	20	6	22	2	38	38	39	29	14	22	8¼	10¼	12⅚	13⅚
24	2	26	4	27	11	46	68	63	70	26	19	.....	11¼	12¼	12⅔
22	11	25	4	27	11	40	55	70	74	29	31	.....	12½	15⅜	17⅙
14	4	16	9	18	11	29	28	35½	31	29	26	7⅚	10	11	11⅛
11		13	3	15	7	15	22	28½	29	27	28	9 1/12	12	15⅙	16½
13	4	15	4	17	6	26	29	32½	29	24	26	7⅓	9⅓	10⅚	11 5/24
11	6	13	8	15	8	20	23	29	29	26	24	8¾	13¼	15⅝	17 11/24
14	10	17	2	19	2	25	31	35	34	28	24	......	15½	18	20⅓
11	11	14	2	16	3½	20	23	32	31	27	25½	.....	12¼	14 7/12	16 7/24
14	11	17	1	18	8	29	30	36	33	26	19	..	15	17 7/24	18 7/12
14	3	16	6	18	9	22	23	26	28	27	27	5½	8¼	9 5/24	9 11/12
8	1	10	2	12		12½	18	23	22½	25	22	...	9	11¼	12 11/12
7	9½	9	10½	11	11	12	16	22	24	25	24½	....	10⅓	13¼	15⅜
8	11	10	11	12	5	18	21	24	24	24	18	......	9¼	10⅞	12¾
9	2½	10	11½	12	4½	17	19	24½	22	21	17	.....	9½	11⅙	12 19/24
10	5	12	3	13	11	22	22	26	25	22	20	......	10¾	13 5/24	14 11/12
10	6	12	1	13	4	21	19	22	21	19	15	.. ..	8½	9⅔	10 13/24
8	5	9	10	10	9	12	21	21½	21	17	11	....	6¼	6⅝	7 5/24
7	8	8	11	9	11	10	18	22	19	15	12	......	6½	7⅝	8⅚
10	8	11	10	13		19	29	29	18	14	14	6	8¼	9¾	10⅔
10	1	12	2	14	5	16	23	25	27	25	27	5	8¼	10 13/24	11 13/24
10	10	13	1	15	9	19	25	23	28	27	32	......	8	9 5/12	10 5/12
11	4	13	9	16	2	18	20	31	32	29	29	....	8⅓	9 13/30	11 11/40
9	1	10	2	11	6	21	23	15	15	13	16	.....	7¾	9½	10 11/12
8		8	10	9	10	20	18	15	15	10	12	....	7¾	9⅛	10 13/24
19	3	20	3	21	9	35	41	45	31	12	18	8	11	11 11/12	12 19/24
17	9	19	3	20	5	33	37	42	40	18	14	7½	12	13⅝	14⅚
10	11	13	4	15	8	19½	27½	27½	27½	29	28	4½	8	10	10 23/24
10	1⅓	12	7	15	2	16	24½	24	27	29	31	5	9¼	11 7/12	13 5/12

forest belts at the Central Experimental Farm. The figures published are the average results from the last year the annual growth was taken in measuring the trees, but the crowns of many of them began to change has lessened the apparent annual growth for the year, and in some cases, where the main branches previous.

ARBORETUM.

The arboretum at the Central Experimental Farm is yearly becoming better known and a much larger proportion of the visitors now see this part of the farm. The trees and shrubs are, many of them, becoming very prominent, the evergreens being especially attractive. Nearly all the genera which are hardy are now represented, some of them by a large number of species. The perennial border which is over half a mile long is almost filled with plants, and these from early spring until late autumn produce a succession of lovely and interesting flowers. Each year valuable data on the hardiness and time of blooming of the trees, shrubs and plants is secured, and it is hoped that in the near future a list will be published of all that have been tested in the arboretum in which these notes will appear.

PROGRESS OF THE WORK.

It was feared that, on account of the unfavourable winter, the number of deaths, among the trees and shrubs would be large, but on examination it was found that there were not many killed of those which had already wintered at Ottawa, with the exception of a large collection of named varieties of lilacs grafted on the Californian privet (*Ligustrum ovalifolium*), which were almost all destroyed. These had been growing here for three years but never made satisfactory growth. Lilacs grafted on privet are very unsuitable for this part of the country and should on no account be planted. Many new species and varieties of trees and shrubs were procured during the spring and autumn and a large area of additional land which had been broken up last year was utilized for them. The surface soil in the circles about the trees and shrubs, in the parts of the arboretum seeded down, was hoed several times during the summer, and weeds destroyed.

When the mulch of manure was removed from the perennial border it was found that most of the plants had come through the winter in good condition. Large additions were made during the spring, summer, and autumn, to the number grown in 1896 and nearly all the border prepared last autumn was utilized. Throughout the summer, the surface soil was kept loose and free from weeds, with the result that strong growth was made and the plants bloomed well. Stakes were driven down beside the taller growing perennials to prevent their breaking and these proved very effective.

The grass was cut with the pony lawn mower for the first time on the 14th of May and afterwards at intervals until the 15th of September, which kept the lawns at all times in good condition. About eight acres which had been kept cultivated since 1896 were seeded down with lawn grass during the summer and by autumn a very good sod was formed.

The new road machine did splendid work in making up the roads in the arboretum and several, which had previously been only staked out, were opened for the first time. Coal ashes are now being used, spread on the surface, on several of the roads, and when this is rolled in the spring it is hoped that a good firm road-bed will be formed.

Boys proved very mischievous on Sundays in the arboretum this year, plucking flowers, disturbing labels, and destroying valuable fruits and seeds. Notices were of no avail and nothing short of a police patrol is likely to stop the annoyance in future.

DONATIONS.

We again acknowledge, with gratitude, the donations of seeds which have been kindly furnished us by the Royal Gardens, Kew; the Arnold Arboretum; the Missouri Botanic Garden; the Massachusetts Botanic Garden; and the Royal Botanic Gardens, Sapporo, Japan. Acknowledgments are also due to Prof. John Macoun and Mr. J. M. Macoun, of the Geological Survey of Canada, for very useful contributions. A large and valuable collection of seeds of trees and shrubs was received from Mr. J. Niemetz, of Winnitza, Russia, who kindly had many of these collected, especially for the Canadian

Experimental Farms, in one of the coldest districts in Northern Russia. Several private individuals have also kindly contributed useful and acceptable material towards the collection.

ORNAMENTAL TREES AND SHRUBS.

In travelling through Canada, especially in the rural districts, one is often struck by the little effort made by the inhabitants to beautify their homes. With the wealth of native trees and shrubs growing all around, it is surprising that so few people take the trouble to use them for this purpose; and when to these are added other lovely flowering shrubs from foreign countries, easily procured, one fails to understand why the farm house and surroundings, remain bare and uninviting. Lack of time is often given as the cause of this neglect, but one or two trees and shrubs planted in the spring and autumn of each year take but little time, and would soon grow up to be attractive objects around the dwelling.

To get the best results in planting ornamental trees and shrubs, it is important to give them good soil to begin with, and if that in which they are to be planted is not of this quality, it will repay the planter to procure some, but no manure should be used about the roots in any case. Trees and shrubs from one to two feet in height are the best size for planting, as at that height they transplant easier and make more shapely specimens than when larger. The holes should be made somewhat larger than the roots actually require, and the tree or shrub planted a little lower in the ground than where it had been growing in the nursery or woods, and the hole then filled with good soil, pressed firmly about the roots. Great care should be taken that the roots do not become dry from the time they are dug until they are re-planted in their permanent position. This is especially applicable to evergreens. Planting may be done either in spring or autumn, but spring is the preferable time. The surface soil about the tree should be kept loose with the hoe throughout the summer, which will ensure a more rapid growth than if weeds or grass are allowed to grow about them. By keeping the soil loose each year in this manner, the tree or shrub will soon reach a good size. A mulch of manure applied late in the autumn on the surface of the soil about the tree, will protect the roots from severe frost during winter, and enrich the soil.

The following list of one hundred species and varieties of trees and shrubs, hardy at Ottawa, is given so that the intending planter may ascertain the best kinds to plant. The names in the list are selected from nearly 2,500 species and varieties, growing in the arboretum at the Central Experimental Farm, and are all of exceptional merit. Notes are given on each species so that the reader may know whether the tree or shrub is noted for its flowers, fruit, or foliage; when it blooms, where it is native; and the height it grows. For the information of those who have not room for a large collection the best twenty-five are distinguished by a star preceding the name.

LIST OF ONE HUNDRED HARDY ORNAMENTAL TREES AND SHRUBS.

1. *Acer dasycarpum laciniatum.*—Wier's cut-leaved maple (Canada), height, 40 to 50 feet. This is a cut-leaved variety of the native silver-leaved maple, which originated in Europe, and is a very quick growing, robust tree, with large, deeply cut leaves, and pendulous branches. It requires plenty of space to appear to the best advantage.

2. *Acer platanoides.*—Norway maple (Europe). Height, 30 to 50 feet. The Norway maple is one of the hardiest of ornamental trees. The dark green leaves appear before those of our native hard maple and fall from two to three weeks later in the autumn, but do not assume such a brilliant colour, the leaves having different shades of yellow.

* 3. *Acer platanoides Schwedleri.*—Schwedler's Norway maple. One of the best ornamental trees. The leaves are large and in the early part of the summer are of a bright, purplish red becoming duller as the season advances.

4. *Acer saccharinum.*—Hard, or sugar maple (Canada). Height, 50 to 70 feet. The hard maple needs no description. Its clean, clear green leaves, almost free from insect pests, handsome form, delicately and highly tinted leaves in autumn, recommend it as one of the best of hardy trees.

5. *Acer tataricum Ginnala.*—Ginnalian maple (Amurland). Height, 10 to 20 feet. The deeply cut, pretty leaves, of this little maple, make it ornamental throughout the summer, and in the autumn it rivals all other maples in the variety and brilliancy of its colouring.

6. *Æsculus (Pavia) flava.*—Sweet buckeye (United States). Height, 20 to 25 feet. In bloom, third week of May. Flowers, pale yellow. This is the tallest growing species of buckeye and forms a very shapely little tree.

7. *Æsculus Hippocastanum.*—Horse chestnut (Mountains of South-eastern Europe). The horse chestnut is well known. At Ottawa, all specimens have not proven hardy, but if procured from northern grown stock they should do well. This tree is very ornamental when in full leaf and flower.

8. *Alnus glutinosa imperialis.*—Imperial cut-leaved alder (Europe). Height, 20 to 30 feet. The cut-leaved alder is a very distinct and graceful tree with deeply cut fern-like leaves and pendulous branches.

9. *Ampelopsis quinquefolia hirsuta.*—Self fastening Virginian creeper (Ontario). It is unfortunate that this very valuable climber is not more widely distributed. The leaves are smaller than those of the ordinary form and quite downy, but the most marked distinction is its power of clinging to brick, wood, or stone, almost as tightly as Japanese ivy. In the autumn, the leaves are highly coloured and very effective when growing on a wall, house or fence.

10. *Berberis Aquifolium.*—Oregon grape (British Columbia). Height, 1 to 2 feet. In bloom, third week of May. Flowers, bright yellow. Leaves evergreen, smooth and shiny.

*11. *Berberis Thunbergii.*—Thunberg's barberry (Japan). Height, 2 to 4 feet. The best barberry for ornamental purposes. It is a dwarf, compact shrub, with bright, green leaves in summer, changing in autumn to deep red. The scarlet fruit is borne very profusely and makes this barberry quite ornamental throughout the winter.

12. *Berberis vulgaris purpurea.*—Purple-leaved barberry (Europe). Height, 4 to 6 feet. In bloom, fourth week of May. The yellowish flowers in pendulous clusters make a fine contrast with the leaves which are bright purple, when young, becoming duller later in the autumn.

*13. *Betula alba laciniata pendula.*—European cut-leaved birch (Europe). Height, 30 to 50 feet. One of the most graceful and hardy of all ornamental trees. The pendulous branches, finely cut foliage, and elegant form of this birch make it very desirable.

14. *Caragana arborescens.*—Siberian pea-tree (Siberia). Height, 10 to 15 feet. In bloom, third week of May. Flowers, bright yellow and pea shaped. The delicate green leaves of this shrub open very early and are quite attractive throughout the summer. This is one of the hardiest shrubs grown.

*15. *Caragana frutescens.*—Woody caragana (South Russia to Japan). Height, 3 to 4 feet. In bloom, third week of May. The flowers of this species are larger than those of *Caragana arborescens*, the leaves are formed differently, and its branches are pendulous. It is a smaller shrub than the Siberian pea tree but quite as desirable.

16. *Carya alba.*—Shell bark hickory (Canada). Height, 30 to 50 feet. The hickory is a slow growing tree but in time it becomes a very handsome object on the ornamental grounds.

17. *Catalpa Kæmpferi.*—Japanese catalpa (Japan). Height, 30 feet. In bloom, second week of July. Flowers, yellow, spotted with purple and smaller than those of the hardy catalpa. The leaves are purple veined. This is the hardiest catalpa grown here.

18. *Catalpa speciosa.*—Hardy catalpa (United States.) Height, 30 to 40 feet. In bloom, fourth week of June. Flowers, large, white, spotted with purple and yellow. This tree is very handsome when the flowers are in bloom The leaves are large and heart-shaped. The seed pods which form during the latter part of the summer become more than one foot in length. The whole tree is very tropical looking. To ensure hardiness, trees should be obtained from northern grown stock as but few specimens have proved hardy at Ottawa.

19. *Celastrus articulatus.*—Japanese climbing bitter-sweet (China and Japan). This is very distinct from *Celastrus scandens*, the native climbing bitter-sweet, with smaller and more abundant berries, which are yellow and orange in colour, in that respect especially differing from the native species. It is perfectly hardy and makes a fine climber.

20. *Celastrus scandens.*—Climbing bitter-sweet (Canada). This pretty climber, with its bright green leaves and showy scarlet and orange berries, is very desirable. It may be grown in a low compact mass by keeping the stems well cut back. Treated in this way it makes a very attractive object when covered with fruit, which remains throughout the winter.

21. *Cercidiphyllum japonicum.*—Katsura tree (Japan). Height, 30 to 50 feet. The pyramidal shape and delicate heart-shaped leaves of this tree make it very attractive and ornamental. It is closely related to the magnolia family but is quite hardy at Ottawa.

22. *Cornus alba sibirica variegata.*—Variegated Siberian dogwood. Height, 4 to 6 feet. A handsome shrub with silvery variegated leaves. Quite hardy.

23. *Cratægus coccinea.*—Scarlet fruited hawthorn (Canada). Tree. Height, 10 to 20 feet. In bloom, fourth week of May. Flowers, white, borne in great profusion. This valuable native tree is ornamental in spring, summer, and autumn. The flowers are pretty, the leaves dark and shiny, and the fruit bright red and very showy.

24. *Cratægus Crus-galli.*—Cockspur thorn (Ontario). Tree. Height, 15 to 25 feet. In bloom second week of June. Flowers, white tinged with pink. The leaves of this tree are very ornamental, being thick, smooth, and very shiny.

25. *Daphne Cneorum.*—Garland flower (Eastern Europe). Height, 1 to 1½ feet. In bloom, second week of May. Flowers, bright pink and sweet scented. A very pretty little evergreen quite suitable for flower borders. It blooms a second time in autumn.

26. *Diervilla candida.*—White flowered weigelia (China). Height, 4 feet. In bloom, first week of June. Flowers, pure white, making a charming contrast with the pink-flowered varieties.

27. *Diervilla rosea.*—Pink-flowered weigelia (China). Height, 4 to 5 feet. In bloom first week of June. Flowers, pink. The weigelias are very well known and much admired flowering shrubs. Of this species there are a number of fine varieties.

*28. *Diervilla rosea Sieboldii variegata.*—Siebold's variegated weigelia (China). Height, 4 feet. In bloom, first week of June. Flowers, pink and white. Leaves beautifully variegated with white and pale green. This is the hardiest variety of weigelia tested here.

29. *Elæagnus angustifolia.*—Russian olive (South Europe, Orient). Height, 15 to 20 feet. In bloom, third week of June. Flowers, small, yellow, very sweet scented. This is a very ornamental tree with narrow silvery leaves and is perfectly hardy.

30. *Elæagnus argentea.*—Wolf willow (Canada.) Height, 8 to 12 feet. Blooms in 4th week in May. Flowers, small, yellow, and very sweet scented. The leaves which make this shrub ornamental are large and silvery. As it suckers considerably this should be taken into account when planting.

31. *Genista tinctoria.*—Dyer's greenweed (Europe). Height, 1 to 2 feet. In bloom fourth week of June. Flowers, bright yellow, pea-shaped. A very beautiful little shrub continuing in bloom for some time.

32. *Ginkgo biloba.*—Maiden-hair tree (China). Height, 20 to 60 feet. This pretty, graceful tree is a deciduous conifer with peculiar fan-shaped leaves. It is rather a slow grower but eventually reaches a good size.

*33. *Hydrangea paniculata grandiflora.*—Large flowered Hydrangea (Japan). Height, 5 to 10 feet. In bloom, fourth week of July. Flowers, white, gradually becoming pink, in very large panicles. This is one of the finest of hardy flowering shrubs.

34. *Hypericum kalmianum.*—Kalm's St. John's wort (Ontario). Height, 2 to 4 feet. In bloom, second week of July. Flowers, large, bright yellow. A very ornamental late flowering shrub.

35. *Ilex verticillata.*—Black alder, winterberry (Ontario). Height 6 feet. This shrub is most ornamental in autumn when it is covered with bright scarlet berries.

*36. *Larix europæa.*—European larch (Europe). Height, 60 to 80 feet. This tree is more graceful than our native tamarac and will succeed on a greater diversity of soils.

37. *Ligustrum amurense.*—Amur privet (China and Japan). Shrub. Height, 4 to 6 feet. This is the only privet tested here which has proved perfectly hardy. It is a pretty little shrub.

*38. *Lonicera Alberti.*—Albert Regel's honeysuckle (Turkestan). Height, 2 to 4 feet. In bloom, fourth week of May. Flowers, bright pink. This beautiful little honeysuckle with its sweet scented flowers, pendulous branches, and narrow leaves, is one of the most hardy and desirable shrubs.

*39. *Lonicera sempervirens.*—Scarlet trumpet honeysuckle (United States). This very attractive climbing honeysuckle blooms almost continuously from the first week of June until late autumn. The profusion of bright, scarlet, trumpet-shaped flowers produce a fine effect where trained against a house or wall.

*40. *Lonicera tatarica.*—Tartarian honeysuckle, bush honeysuckle (Siberia, Tartary). Height, 5 to 10 feet. In bloom third week of May. Flowers, bright pink. This is an old favourite and one of the hardiest shrubs grown. A variety called *grandiflora* is an improvement on the ordinary type with larger flowers striped with white. There are also white flowered and yellow fruited varieties.

*41. *Neillia (spiræa) opulifolia aurea.*—Golden leaved spiræa (Canada). Height, 6 to 10 feet. A very vigorous growing, hardy shrub, with yellow leaves. Fine for contrasts on the lawn.

42. *Populus deltoidea aurea.*—Golden leaved poplar (Canada.) A very pretty, graceful, golden leaved tree, retaining its colour throughout the season. This is also known as *Populus monilifera aurea* and *Populus canadensis Van Geertii.*

*43. *Philadelphus coronarius*—Mock orange or Syringa (South Europe). Height, 5 to 10 feet. In bloom second week of June. Flowers, white, with a strong, sweet odour. A well known, popular shrub. There are several varieties, two of the most ornamental being the golden leaved and double flowered forms.

*44. *Philadelphus grandiflorus speciosissimus.*—This is a great improvement on *Philadelphus grandiflorus*, with larger, whiter, and more abundant flowers. It blooms in the third week of June. It is a smaller shrub than *P. grandiflorus.*

45. *Platanus occidentalis.*—Button-wood (Ontario). Height, 50 to 60 feet. A very handsome and striking native tree, with large, deeply cut foliage.

46. *Potentilla fruticosa.*—Shrubby cinque-foil (Canada). Height, 2 to 4 feet. In bloom, second week of June. Flowers, large, bright yellow. A very pretty shrub when in bloom.

47. *Pyrus Aucuparia*—European mountain ash, rowan tree (Europe). Height, 20 to 30 feet. In bloom, fourth week of May. Flowers, white, borne in large clusters. This is a very graceful lawn tree, remaining ornamental throughout the winter when it

is covered with its scarlet fruit. The American species is also very good. It is a smaller, more compact tree, flowering about one week later than the European.

48. *Pyrus baccata.*—Siberian crab (Siberia). Height, 15 to 20 feet. In bloom, third week of May. Flowers, white, tinged with bright pink. This compact little tree bears such a profusion of flowers in spring that it is one of the most ornamental at that time, and later in the summer, when the highly-coloured fruit hangs thickly among the leaves, it is again very handsome. This is one of the hardiest trees grown here.

49. *Pyrus (Cydonia) Maulei.*—Maule's Japanese quince (Japan). Height, 1 to 3 feet. In bloom, second week of May. Flowers, bright red. The flowers of this little shrub are very ornamental, and in the autumn, when the golden coloured, highly perfumed quinces are ripe, it makes a very interesting object. It is much hardier than *Pyrus japonica*, of which some authorities call it a variety.

50. *Quercus rubra*—Red oak (Canada). A large, handsome tree, with very glossy leaves which turn red in autumn and at that time render it very ornamental.

51. *Ribes aureum.*—Missouri currant (United States). Height, 6 to 8 feet. In bloom, fourth week of May. Flowers, yellow and very sweet scented. This currant is quite ornamental, especially when in bloom, and again in summer the fruit, which is very palatable, makes it attractive at that time.

52. *Rosa rubrifolia.*—Red-leaved rose (Europe). Height, 6 feet. In bloom, second week of June. The bright pink flowers of this species are rather small, but the purplish red leaves are very ornamental. This rose does not sucker.

53. *Rosa rugosa.*—Japanese rose (Japan). Height, 4 to 5 feet. In bloom, second week of June. Flowers, very large and deep pink. This is a beautiful rose with fine flowers and very ornamental leaves which are large, thick and shiny. There is a white-flowered variety which is also good.

54. *Robinia hispida.*—Moss or rose locust (United States). Height, 8 feet. In bloom, fourth week of June. Flowers, deep pink. The experience with this tree is yet very limited here, but it proved hardy last winter which was a severe test for all trees and shrubs. It is very beautiful and if it continues hardy will be desirable.

55. *Spiræa arguta.*—(Europe). Height, 2 to 4 feet. In bloom, third week of May. Flowers, pure white, produced very profusely in compact clusters. This is the earliest flowering spiræa grown here, and is one of the best hardy shrubs of recent introduction. It is a graceful little spiræa with pendulous branches but its chief beauty lies in the abundance of its flowers.

56. *Spiræa japonica (callosa).*—Japanese spiræa (Japan). Height, 2 to 4 feet. In bloom, fourth week of June. Flowers, bright rosy red. This is a very pretty spiræa which continues to bloom throughout the greater part of the summer. A variety called *Bumalda* is more dwarf and very ornamental. An improvement on *Bumalda* is one called Anthony Waterer which has crimson flowers.

57. *Spiræa bracteata.*—Round leaved spiræa (Japan). Shrub. Height, 3 to 4 feet. In bloom, second week of June. Flowers, pure white borne profusely in compact clusters. Very ornamental when in full bloom. This shrub is also known as *Spiræa rotundifolia alba.*

58. *Spiræa salicifolia.*—Willow-leaved spiræa (Canada). Height, 4 to 5 feet. In bloom, first week of July. Flowers pink or white, in large panicles. This is a late bloomer and is valuable on that account. It is known among some nurserymen as *Spiræa Billardii.*

59. *Spiræa sorbifolia.*—Sorbus-leaved spiræa (Himalaya to Japan). Height, 4 to 5 feet. In bloom, fourth week in June. Flowers, white, borne in very large panicles. This is a strong growing species but suckers considerably.

*60. *Spiræa Van Houttei.*—Van Houtte's spiræa (Europe). Height, 3 to 5 feet. In bloom, first week of June. Flowers, pure white, borne very profusely in small, compact clusters, on pendulous branches. This graceful shrub is very beautiful when in full bloom.

*61. *Sambucus nigra foliis aureis.*—Golden-leaved elder (Europe). Height, 5 to 10 feet. The leaves of this variety are bright golden yellow which make it an attractive shrub on the ornamental grounds.

62. *Symphoricarpus racemosus.*—Snowberry (Canada). Height, 3 to 4 feet. This shrub has small rose-coloured flowers but its chief beauty lies in the large pure white berries which render it very ornamental in autumn.

63. *Syringa chinensis (rothomagensis).*—Rouen lilac. Garden origin. Height, 5 to 10 feet. This a hybrid between *s. persica* and *s. vulgaris.* In bloom, fourth week of May. Flowers, bright violet purple. A very profuse bloomer with much the habit of *Syringa persica* but bearing more highly coloured flowers.

64. *Syringa japonica*—Japanese lilac (Japan). Height, 15 to 20 feet. In bloom, fourth week of June. Flowers, creamy white, without perfume, borne in very large panicles. This is the latest blooming lilac tested here being more than one month later than the common species.

65. *Syringa Josikæa.*—Josika's lilac (Hungary). Height, 5 to 10 feet. In bloom first week of June. Flowers, bluish purple without perfume. This lilac blooms about two weeks later than the common species. The leaves are deep green and shiny which make it quite ornamental throughout the summer.

66. *Syringa oblata.*—Heart-leaved lilac (China). Height, 10 to 15 feet. In bloom, fourth week of May. Flowers bright purple. This is a very ornamental species with heart-shaped, shiny leaves. It blooms a little later than the common species.

67. *Syringa villosa.*—Rough-leaved lilac (North China). Height, 4 to 6 feet. In bloom, first week of June. Flowers, pale purple. This is a very handsome species blooming about a week later than the common lilac.

*68. *Syringa vulgaris alba grandiflora.*—Large-flowered white lilac (Europe). This is an improvement on the common white lilac with larger flowers and panicles. It blooms during the third week of May.

*69. *Syringa vulgaris, Charles X.*—Charles X lilac (Europe). Height, 8 to 12 feet. In bloom, fourth week of May. Flowers, deep purplish lilac, very sweet scented. A profuse bloomer and one of the finest lilacs grown.

70. *Salix rosmarinifolia*—Rosemary-leaved willow (Europe). Height, 6 to 10 feet. This is a very ornamental willow with long narrow rosemary-like leaves.

71. *Salix Laurifolia.*—Laurel-leaved willow (Europe). Height, 20 to 30 feet. The leaves of this willow are deep green and very shiny. When given room to develop symmetrically, it makes a very handsome specimen on the ornamental grounds.

*72. *Viburnum Lantana.*—Way-faring tree (Europe). Height, 8 to 12 feet. In bloom, third week of May Flowers, white in compact flat heads. The fruit is very ornamental, being scarlet, turning to dark purple when ripe.

73. *Viburnum Opulus.*—Guelder rose, high bush cranberry (Canada). Height, 6 to 8 feet. In bloom, second week of June. Flowers, white, in large clusters. This is, at all seasons of the year, an ornamental shrub, as the abundant bright scarlet fruit remains on the bush all winter.

*74. *Viburnum Opulus sterile.*—Snowball. Height, 8 to 10 feet. In bloom, second week of June. The almost round clusters of pure white flowers of this shrub are well known. This is one of the most ornamental flowering shrubs grown here.

75. *Viburnum prunifolium*.—Plum-leaved viburnum (Canada). Height, 10 to 15 feet. In bloom second week of June. Flowers, white, in compact, flat heads. The leaves of this species are very ornamental, being smooth and glossy.

EVERGREENS.

76. *Abies concolor.*—White fir (Colorado). Height, 30 to 60 feet. This is a very beautiful species with large, flat, glaucous, green leaves. Young trees of this species should be obtained from northern-grown stock, as it seems to be at its limit of hardiness here.

77. *Cupressus ericoides.*—Heath-like retinospora (Japan). Height, 2 feet. This is a very pretty dwarf evergreen, with fine, soft, delicate green foliage, which becomes of an attractive purplish tinge in winter.

78. *Cupressus pisifera (Retinospora pisifera).*—(Japan.) The retinosporas are all ornamental, and this is one of the best. It is of pendulous form with bright green leaves and a very graceful habit.

79. *Cupressus pisifera filifera.*—(Japan). This is a very distinct and beautiful variety with drooping branches and slender thread-like pendulous branchlets.

*80. *Cupressus pisifera plumosa.*—(Japan). A more compact tree than *Cupressus pisifera*, but very ornamental. Its branchlets are somewhat feathery in form.

81. *Cupressus pisifera plumosa aurea.*—(Japan). One of the most beautiful golden leaved, evergreen shrubs in cultivation. It is of compact form and holds its colour well.

82. *Juniperus communis fastigiata.*—Irish juniper (Europe). Height, 4 to 8 feet. The Irish juniper is an erect, compact form of *Juniperus communis* with light green foliage, silvery beneath. It makes a very attractive shrub on the lawn.

83. *Juniperus Sabina tamariscifolia.*—Tamarisk-leaved savin (Europe). Height, 1 to 2 feet. This is a low growing variety with widely spread trailing branches and attractive foliage.

84. *Pinus austriaca.*—Austrian pine (Austria). Height, 30 to 60 feet. A very handsome pine with dark green rigid leaves and upright branches. This is a very compact growing species and one of the most beautiful.

*85. *Pinus montana Mughus.*—Dwarf mountain pine (Mountains of Central Europe). Height, 2 to 10 feet. This is a very ornamental, dwarf, compact pine. Its height varies considerably, some specimens being quite dwarf and others attaining a height of about 10 feet.

86. *Pinus ponderosa.*—Heavy wooded or bull pine (British Columbia). Height, 50 to 80 feet. The bull pine is one of the most handsome species. The long glaucous green leaves, sometimes twisted into peculiar forms, and its upright branches, give it a very majestic appearance.

87. *Pinus resinosa.*—Red pine (Canada). Height, 40 to 60 feet. Not unlike the Austrian pine when young, but becoming less stiff in form as it becomes larger. The leaves are also much softer than those of the Austrian pine.

88. *Pinus Sylvestris.*—Scotch pine (Europe). Height, 40 to 60 feet .A very rapid growing pine with bluish green leaves. It is not so shapely as some of the other species, but grows well in nearly all kinds of thoroughly drained soils.

89. *Pinus Strobus.*—White pine (Canada). Height, 50 to 75 feet. The white pine is better known as a timber tree in Canada than as an ornamental tree, but when it branches from near the ground, and has sufficient space to develop symmetrically, it becomes one of the most graceful evergreens grown. The leaves which preserve their colour well in winter are a very lively green.

90. *Picea alba.*—White spruce (Canada). Height, 30 to 50 feet. A very beautiful native species with glaucous green leaves and rather rigid branches but making a fine ornamental tree.

*91. *Picea alcockiana.*—Alcock's spruce (Japan). Height, 40 to 60 feet. This is a very ornamental Japanese species, and quite distinct from all others. The dark green of the upper part of the leaves, and the bluish silvery green of the lower surface, make it very attractive.

*92. *Picea excelsa.*—Norway spruce (Europe). Height, 50 to 75 feet. The Norway spruce is one of the most popular evergreens planted, being a very rapid grower, of graceful form, and doing well on a great variety of soils.

*93. *Picea pungens glauca.*—Rocky mountain blue spruce (Western United States). Height, 40 to 60 feet. A very beautiful species with steely blue coloured leaves. One of the most ornamental trees. It is a slow grower and takes some years before it attains much height. As this tree varies in colour from green to blue, in procuring young trees, the blue variety should be ordered.

94. *Pseudotsuga Douglasii.*—Douglas fir (British Columbia). Height, 50 to 75 feet. The Douglas fir is a very majestic and handsome tree, with foliage dark green above and silvery beneath. The seed or young trees should be obtained from as far north as possible, or high up on the mountains, as otherwise it is not likely to prove hardy.

*95. *Thuya occidentalis aurea Douglasii.*—Douglas' golden arbor-vitæ (United States). This is a very beautiful form with bright golden coloured foliage and upright habit.

96. *Thuya occidentalis compacta.*—Compact arbor-vitæ (United States). A dwarf compact variety with bright green foliage.

97. *Thuya occidentalis Ellwangeriana.*—Ellwanger's arbor-vitæ (United States). This is a fine, compact, dwarf, vigorous variety, with slender leaves and branches.

*98. *Thuya occidentalis Hoveyi.*—Hovey's arbor-vitæ (United States). This is one of the finest and most desirable varieties. The leaves are bright green and the branches flat and parallel, giving the shrub a very remarkable and attractive appearance.

99. *Thuya occidentalis pyramidalis.*—Pyramidal arbor-vitæ (United States). The pyramidal arbor-vitæ is a very compact upright grower, and its columnar form makes it one of the most conspicuous objects on the grounds.

100. *Thuya occidentalis wareana (Sibirica).*—Siberian arbor-vitæ (Europe). The Siberian arbor-vitæ is a well known compact form with deep green, blunt leaves, which keep their colour well in winter.

PERENNIALS.

No flower garden is complete without perennials. Even though the plot of ground be small, some of the precious space should be allotted to a few of the finest examples of this large and varied class of plants. Few flowers require as little care as perennials if given the proper conditions to start with. The soil should be a good loam, well drained, for thorough draining is very essential. When planted, they should be left undisturbed as long as possible, hence the soil must be well prepared by trenching, with a liberal supply of well rotted cow manure, dug under. Most perennials thrive best in full sunshine, and, where it is possible, they should be planted where they will get the most favourable conditions. A southern aspect is the most suitable, and where there is protection from the cold winds the plants do best. Planting may be done either in spring or fall but September is probably the best time to plant perennials. Throughout

the growing season the surface soil should be kept loose and free from weeds. During the summer, the taller growing sorts will need staking, as fine specimens are liable to be broken by storms if this is neglected. When the flowers have ceased blooming, the old stalks should be cut off near the ground. Just before permanent frost sets in, the border or bed should be given a liberal dressing of strawy manure. This will form a fine mulch for the protection of the plants and at the same time enrich the soil. The mulch ought not to be removed too soon in the spring, as often most of the damage done to perennials is at that season when so much thawing and freezing takes place.

The following list of one hundred of the best hardy perennials growing at the Central Experimental Farm, selected from over 1,000 species and varieties, is published for the purpose of assisting any who may desire to obtain a choice collection of these plants. In this list will be found the scientific and common name of each; its native home; when it begins to bloom; how tall it grows; the colour, size and other characteristics of the flower; also any other notes deemed advisable. For the information of those who have no room for a large collection, the best twenty-five are distinguished by a star preceding the name.

LIST OF ONE HUNDRED OF THE BEST HARDY PERENNIALS.

*1. *Achillea Ptarmica flore pleno.*—Double sneezewort (Northern Hemisphere). Height, 1 foot. In bloom fourth week of June. Flowers small, pure white, double, and borne in clusters. A fine perennial, blooming freely throughout the summer.

2. *Aconitum autumnale.*—Autumn flowering monk's hood (Europe). Height, 3 to 4 feet. Blooms in September. Flowers, bluish purple, borne in loose panicles. Valuable as a late bloomer.

3. *Aconitum Napellus.*—Common monk's hood or helmet flower (Northern Hemisphere). Height, 3 to 4 feet. Blooms in July. Flowers, deep blue, borne on a large terminal spike. A fine species, desirable for the rear of the border.

4. *Adonis vernalis.*—Ox-eye (Europe). Height, 6 to 9 inches. In bloom first week of May. Flowers, large, lemon yellow, borne singly from the ends of the stems. A very beautiful early flowering perennial.

5. *Agrostemma coronaria atropurpurea.*—Mullein pink (South Europe). Height, 1 to 2 feet. In bloom fourth week of June. Flowers, medium size, bright crimson, borne singly from the sides and ends of the stems. A very showy flower with silvery foliage, and continues to bloom throughout the summer.

6. *Anemone patens.*—Spreading pasque flower (North America). Height, 6 to 9 inches. In bloom fourth week of April. Flowers, large and deep purple. Very early. A beautiful flower.

*7. *Anthemis tinctoria Kelwayi.*—Kelway's hardy golden Marguerite (Europe). Height, 1 to 2 feet. In bloom fourth week of June. Flowers, large, deep yellow, borne singly on long stems. It continues to bloom profusely throughout the summer; is very showy and valuable for cutting.

8. *Aquilegia canadensis.*—Wild columbine (Canada). Height, 1 to 1½ feet. In bloom third week of May. Flowers, medium size, red and yellow. One of our prettiest wild flowers.

*9. *Aquilegia chrysantha.*—Golden spurred columbine (New Mexico). Height, 3 to 4 feet. In bloom fourth week of June. Flowers, large, bright lemon yellow, with long slender spurs. A very handsome perennial and much later than other columbines.

*10. *Aquilegia coerulea.*—Rocky Mountain columbine (Rocky Mountains). Height, 1 to 1½ feet. In bloom fourth week of May. Flowers, large deep blue with white centre and long spurs. A very beautiful species, of which there are some charming varieties in cultivation.

11. *Aquilegia glandulosa.*—Altaian columbine (Siberia). Height, 1 foot. In bloom third week of May. Flowers, large, deep blue, with white centre and short spurs.

12. *Aquilegia oxysepala.*—Russian columbine (Northern Asia). Height, 1 foot. In bloom second week in May. Flowers, large, deep purplish blue with blue and yellow centres, a very desirable early species, one of the best.

13. *Aquilegia Stuarti.*—Stuart's columbine (Europe). Height, 9 to 12 inches. In bloom third week of May. Flowers, large, deep blue with white centre, one of the best.

14. *Arabis alpina.*—White alyssum (Europe, North America). Height, 6 inches. In bloom first week in May. Flowers, small, pure white, in clusters. One of the earliest bloomers.

15. *Arnebia echioides.*—Prophet flower (Armenia). Height, 9 inches. In bloom third week of May. Flowers, yellow, borne in clusters, with petals spotted with purple. One of the most charming of early flowering plants.

16. *Asclepias tuberosa.*—Pleurisy root (Ontario). Height, 1½ to 2 feet. In bloom third week of July. Flowers, bright orange, borne in clusters. Very showy.

17. *Aster alpinus.*—Alpine aster (Canada, Europe). Height, 9 inches. In bloom first week of June. Flowers, large, bright purple, borne on long stems from the base of the plant. The earliest flowering of all the asters.

*18. *Aster Amellus bessarabicus.*—Bessarabian aster (Russia). Height, 1 to 1½ feet. Blooms from July to September. Flowers, large, deep purple, borne singly on long stems. Very fine. Splendid as cut flowers.

19. *Aster Novae Angliae roseus.*—Pink flowered New England aster (Ontario). Height, 5 to 7 feet. In bloom fourth week of August. Flowers, bright pink, borne profusely in large terminal clusters. Very showy. A strong growing variety.

20. *Boltonia asteroides.*—False chamomile (Canada). Height, 4 to 5 feet. Blooms in September. Flowers, smaller than the next, pale pink, borne very profusely in large panicles. Much later than the next species. Valuable as a showy, late flowering perennial.

21. *Boltonia latisquama.*—(Canada). Height, 4 feet. In bloom first week of August. Flowers, large, white, somewhat resembling asters, and borne very profusely in large panicles. A very fine perennial.

22. *Campanula carpatica*—Carpathian bellflower (Eastern Europe). Height, 6 to 9 inches. In bloom first week of July. Flowers, medium size, deep blue, borne profusely in loose panicles. It continues in bloom throughout the summer. Flowers, fine for cutting. A white variety of this is also good.

23. *Campanula Grossekii.*—Grosseck's bellflower (Eastern Europe). Height, 3 feet. In bloom first week of July. Flowers, large, deep blue borne on a long spike. A comparatively new but very handsome species.

24. *Campanula persicifolia.*—Peach-leaved bellflower (Europe). Height, 3 feet. Flowers, large, blue, borne in a raceme with long flower stems. A very desirable species. There are also white and double varieties which are good.

25. *Clematis recta.*—Erect virgin's bower (South Europe). Height, 4 feet. In bloom fourth week of June. Flowers, small, pure white, borne profusely in dense clusters. This is a very compact bushy species and desirable for the rear of the border. *Clematis Jackmanni* with large deep purple flowers and *Clematis Vitalba* with small white flowers, are excellent climbing sorts.

26. *Convallaria majalis.*—Lily of the Valley (Europe). Height, 6 to 9 inches. Blooms in the latter part of May. This charming, delicately perfumed flower, needs no description.

27. *Coreopsis delphinifolia.*—Larkspur-leaved tick-seed (Japan). Height, 2 to 3 feet. In bloom first week of July. Flowers, large, yellow with dark centres and borne singly with long stems.

28. *Coreopsis grandiflora.*—Large flowered tick-seed (Southern United States). Height, 2 to 3 feet. In bloom fourth week of June. Flowers, large, deep yellow, borne singly on long stems. It continues blooming profusely throughout the summer. Fine for cutting.

*29. *Coreopsis lanceolata.*—Lance-leaved tick-seed (Canada). Height, 2 feet. In bloom fourth week of June. Flowers, large though slightly smaller than the last, and borne on long stems. It continues blooming throughout the season, and is a very desirable perennial.

*30. *Delphinium cashmirianum.*—Cashmerian larkspur (Himalayas). Height, 1½ feet. In bloom first week of July. Flowers, pale to bright blue, in large open heads. A very beautiful low growing species.

31. *Dianthus plumarius flore pleno.*—Double-flowered garden pink (Eastern Europe). Height, 9 inches. In bloom second week of June. Flowers, large, white or pink, very sweet scented, and two or three borne on a stem. A variety called Mrs. Simkins is especially desirable being very double, white and deliciously perfumed, almost equalling a carnation. It blooms during the fourth week of June.

32. *Dicentra spectabilis.*—Bleeding heart (Japan). Height, 3 feet. In bloom second week of May. Flowers, heart-shaped, red and white and borne in pendulous racemes. An old favourite.

33. *Dictamnus albus.*—Gas plant (Europe). Height, 1½ to 2 feet. In bloom second week of June. Flowers, white with an aromatic fragrance, and borne in large terminal racemes. A well known variety, has purple flowers with darker markings. A very striking plant and well worthy of cultivation. It is generally known as *Dictamnus Fraxinella.*

34. *Doronicum caucasicum.*—Caucasian leopard's bane (Europe). Height, 1 foot. In bloom second week of May. Flowers, large, yellow, and borne singly. A fine strong growing early perennial.

*35. *Doronicum plantagineum excelsum.*—Tall plantain-like leopard's bane (Britain). Height, 2 feet. In bloom third week of May. Flowers, large and deep yellow. A fine plant with large flowers.

36. *Epimedium rubrum.*—Red barren-wort (Japan). Height, 1 foot. In bloom second week of May. Flowers, small, bright crimson and white, borne in a loose panicle. A very dainty and beautiful little flower.

37. *Erigeron speciosus.*—Showy fleabane (Western North America). Height, 1½ feet. In bloom second week of July. Flowers, large, violet-blue, with yellow centres, and borne in large clusters on long stems. Very desirable.

38. *Funkia subcordata (grandiflora).*—Large flowered plaintain lily (Japan). Height, 1½ feet. Blooms in August. Flowers, large and white, borne in racemes. The best funkia grown here. Both leaves and flowers are handsome.

*39. *Gaillardia aristata grandiflora.*—Large flowered Gaillardia or blanket flower (Western North America). Height, 1½ feet. In bloom third week of June. Flowers, large, yellow, with deep orange centres, and borne singly on long stems. The named varieties, Superba and Perfection, are more highly coloured and are of great merit. These all continue blooming profusely until late in the autumn.

40. *Gypsophila paniculata.*—Infant's breath (Europe). Height, 2 feet. In bloom second week of July. Flowers, small, white, borne profusely in large open panicles. A very graceful plant.

41. *Helenium autumnale.*—Autumn flowering sneezewort (Canada). Height, 6 to 7 feet. In bloom second week of July. Flowers, large, deep yellow, borne in large heads. Very ornamental in late summer.

42. *Helianthus doronicoides.*—(Canada). Height, 6 to 7 feet. In bloom second week of August. Flowers, large, bright yellow, and borne singly. Very fine; continues blooming for several weeks.

43. *Helianthus multiflorus.*—Soleil d'Or (United States). Height, 4 feet. Blooms in August. Flowers, large, double, bright yellow, and borne singly. A very striking late flowering perennial.

44. *Heuchera sanguinea.*—Blood-coloured alum-root (Northern Mexico). Height, 1 to 1½ feet. In bloom first week of June. Flowers, small, bright, scarlet, borne in open panicles. Continues blooming throughout the summer. Very desirable.

*45. *Hemerocallis Dumortierii.*—Dumortier's day lily (Japan). Height, 1½ feet. In bloom second week of June. Flowers, large, orange yellow, with a brownish tinge on the outside, and three or four on a stem. Very fine.

*46. *Hemerocallis flava.*—Yellow day lily (South Europe). Height, 2 to 3 feet. Blooms in the latter part of June. Flowers, bright orange yellow and fragrant. One of the best.

47. *Hemerocallis minor.*—Lesser day lily (North China and Japan). Height, 1 to 1½ feet. In bloom second week of July. Flowers, medium size and yellow. Blooms later than the two preceding species and has a smaller flower and narrower foliage.

48. *Hibiscus Moscheutos.*—Swamp rose mallow (Ontario). Height, 5 feet. In bloom third week of August. Flowers, very large, varying in colour from white to deep pink. A variety called "Crimson eye" is very good. This plant makes a fine show during late summer.

49. *Hypericum pyramidatum.*—Pyramidal St. John's Wort (Ontario). Height, 3 feet. In bloom fourth week of July. Flowers, large, yellow, and borne singly. A good late flowering perennial.

*50 *Iberis sempervirens.*—Evergreen candytuft (Candia). Height, 6 to 12 inches. In bloom third week of May. Flowers, pure white, fragrant, and borne in dense flat clusters. A fine perennial for cutting.

51. *Iris Chamaeiris.*—(South Europe). Height, 6 inches. In bloom fourth week of May. Flowers, bright yellow with brown markings. A very pretty dwarf species.

52. *Iris flavescens.*—(Eastern Europe and Western Asia). Height, 1½ to 2 feet. In bloom first week of June. Flowers, lemon yellow with brown markings. This species makes a fine contrast with *Iris sibirica*, blooming about the same time.

*53. *Iris florentina.*—Oris root (Central and Southern Europe). Height, 2 feet. In bloom first week of June. Flowers, very large, pale blue or lavender, sweet scented. A splendid Iris,

*54. *Iris germanica.*—German iris (Europe). Height, 2 to 3 feet. In bloom first week of June. Flowers, very large, of elegant form; colour, deep lilac and bright purple, sweet scented. Cannot be too highly recommended. There are a large number of choice varieties of this iris.

*55. *Iris lævigata (Kaempferi).*—Japanese iris (Japan and Siberia). Height, 1½ to 2 feet. In bloom first week of July. Flowers, very large and distinct in colour and shape. The flowers of the type are bright purple, and purple with yellow blotches in the throat, but there are a great many exquisite varieties of this charming plant.

56. *Iris pumila.*—Dwarf iris (Europe, Asia Minor). Height, 4 to 6 inches. In bloom third week of May. Flowers, deep purple. An old favourite. There are several varieties of this pretty little iris but none that excel it.

57. *Iris sibirica.*—Siberian iris (Europe to Siberia). Height, 3 to 4 feet. In bloom fourth week of May. Flowers, deep blue, borne on long stems in clusters of two or three. This species has many varieties.

58. *Iris variegata.*—(Eastern Europe). Height 1 to 1½ feet. In bloom first week of June. Flowers, yellow and brown, veined with various shades of brown.

*59. *Lilium auratum.*—Golden rayed lily of Japan (Japan). Height, 3 to 5 feet, Blooms in July. Flowers, very large, white, with a yellow central band on each petal, and thickly spotted with purple and red. The most showy of all lilies and a splendid flower. This has proven hardy at the Central Experimental Farm, although it has been reported tender in some localities. There are many choice varieties of this lily.

60. *Lilium canadense.*—Canadian lily (Canada). Height, 2 to 3 feet. Blooms in the latter part of May. Flowers, yellow to pale red with reddish spots, pendulous. A very desirable early native species.

61. *Lilium elegans.*—Elegant lily (Japan). Height, 6 inches. In bloom first week of July. Flowers, pale red. A very pretty dwarf lily with several varieties which are better than the type.

*62. *Lilium speciosum.*—Showy japanese lily (Japan). Height, 2 to 3 feet. Blooms in July. Flowers, large, white, tinged and spotted with deep pink and red. A very desirable lily. Hardier than *Lilium auratum* and almost as fine. There are several fine varieties of this flower.

*63. *Lilium superbum.*—Superb lily (Ontario). Height, 4 to 6 feet. In bloom first week of July. Flowers, very numerous, orange red, thickly spotted with dark brown. One of the most robust lilies grown. When in bloom it is a perfect blaze of colour. An admirable lily for the rear of the border.

64. *Lilium tenuifolium.*—Narrow leaved lily (Siberia). Height, 1½ to 2 feet. In bloom third week of June. Flowers, pendulous and bright scarlet. One of the most graceful of all lilies.

65. *Lilium tigrinum.*—Common tiger lily (China). Height, 2 to 4 feet. Flowers, large, deep orange, spotted thickly with purplish black. A very popular old sort.

66. *Linum perenne.*—Perennial flax (Canada). Height, 1½ feet. In bloom first week of June. Flowers, large, deep blue, borne in loose panicles. A very profuse bloomer continuing in flower throughout the summer.

67. *Lobelia cardinalis.*—Cardinal flower (Canada). Height, 2 to 3 feet. Blooms in August. Flowers, bright scarlet, borne in terminal racemes. A very showy and desirable native plant.

68. *Lychnis chalcedonica flore pleno.*—Double flowering, London pride (Russia). Height, 2 to 3 feet. In bloom first week of July. Flowers, bright crimson, double, and borne in terminal racemes. An old favourite.

69. *Lysimachia clethroides.*—Clethra-like loose-strife (Japan). Height, 3 feet. In bloom fourth week of July. Flowers, white, borne in long spikes. A very striking late flowering perennial.

70. *Myosotis alpestris.*—Alpine forget-me-not (Mountains of Europe). Height, 6 inches. In bloom third week of May. Flowers, small, bright blue with a yellowish eye A very profuse bloomer and always popular.

71. *Œnothera missouriensis.*—Missouri evening primrose (United States). Height, 1 foot. In bloom fourth week of June. Flowers, very large, rich yellow, and borne singly. Very beautiful. Continues to bloom throughout the summer.

*72. *Paeonia officinalis.*—Common paeony (Europe). Height, 2 to 4 feet. Blooms in the early part of July. This old favourite needs no description. The double flowered varieties are the best, and can be obtained in several colours and shades.

*73. *Papaver nudicaule.*—Iceland poppy (Mountains of Northern Hemisphere). Height, 1 foot. In bloom second week of May. Flowers, medium size, orange, white, or yellow. This is a very valuable and pretty poppy, blooming almost continuously until late in the autumn.

74. *Papaver orientale.*—Oriental poppy (Asia Minor). Height, 2 to 3 feet. In bloom first week of June. Flowers, very large, scarlet, and variously marked, according to variety, there being many forms of this beautiful poppy.

75. *Pentstemon barbatus Torreyi.*—Torrey's beard tongue (Texas). Height, 2 to 3 feet. In bloom first week of July. Flowers, deep red, borne in long spikes, very ornamental.

76. *Phlox amoena.*—Lovely phlox (Virginia). Height, 6 inches. In bloom second week of May. Flowers, medium size, bright pink, in compact clusters. A fine early species.

*77. *Phlox decussata.*—Hybrid perennial phlox (United States). Height, 1 to 3 feet. In bloom third week of July. Flowers, of many beautiful shades and colours are found in the large number of named varieties of this phlox, which continues to bloom until late in the autumn.

78 *Phlox reptans.*—Creeping phlox (North America). Height, 4 inches. In bloom fourth week of May. Flowers, medium size, purple, and borne in small clusters.

79. *Phlox subulata (setacea).*—Moss pink (North America). Height, 6 inches. In bloom third week of May. Flowers, medium size, deep pink, and borne in small clusters. An old favourite for early effects in the garden.

*80. *Platycodon grandiflorum.*—Large flowered Chinese bellflower (China and Japan). Height, $1\frac{1}{2}$ to 2 feet. In bloom second week of July. Flowers, very large, deep blue, borne singly or in twos. A very profuse bloomer, flowering continuously until autumn. Cannot be too highly praised.

81. *Platycodon grandiflorum album.*—This is a white flowered variety of the last and makes a fine contrast to it when they are grown together. It blooms a few days earlier than the species.

82. *Platycodon grandiflorum* Mariesii (China). Height, 1 foot. In bloom second week of July. Flowers, large and deep blue, a lower growing form of the species but equally as good.

83. *Polemonium coeruleum.*—Jacob's ladder (Northern Temperate Regions). Height, 2 feet. In bloom second week of June. Flowers, deep blue, borne in terminal spikes, very attractive.

84. *Polemonium reptans.*—Creeping Jacob's ladder (North America). Height, 6 inches. In bloom third week of May. Flowers, medium in size, blue, and borne profusely in loose clusters.

85. *Polemonium Richardsoni.*—Richardson's Jacob's ladder (Rocky Mountains). Height, 6 inches. In bloom third week of May. Flowers, medium in size, blue, borne profusely in pendulous panicles.

86. *Potentilla hybrida versicolor.*—(Europe). Height, 1 foot. In bloom fourth week of June. Flowers, large, deep orange and yellow, semi-double. Very fine and quite hardy. A hybrid variety.

87. *Primula cortusoides.*—Cortusa-like primrose (Siberia). Height, 9 inches. In bloom third week of May. Flowers, small, deep rose, in compact heads. A charming little early flowering perennial.

88. *Pyrethrum uliginosum.*—Great ox-eye (Russia). Height, 4 feet. Blooms in September. Flowers, large, white with yellow centres, and borne singly on long stems. A very profuse bloomer. Splendid for cutting.

*89. *Rudbeckia laciniata* Golden Glow (United States). Height, 5 to 6 feet. Blooms in August. Flowers, large, lemon yellow, double, and borne on long stems. Very fine. One of the best of lately introduced perennials, being a very profuse bloomer and vigorous grower.

90. *Rudbeckia maxima.*—Great cone flower (United States). Height, 5 to 6 feet. Blooms in July and August. Flowers, large with a long cone shaped centre, and bright yellow rays, and borne singly. Leaves are large and glaucous. The whole plant is very striking.

91. *Scabiosa caucasica.*—Caucasian scabious (Caucasus). Height. 1½ feet. In bloom first week of July. Flowers, large, light blue, and borne singly on long stems. Blooms very freely throughout the remainder of the summer.

92. *Solidago canadensis.*—Golden rod (Canada). Height, 3 to 5 feet. In bloom first week of August. Flowers, small, golden yellow, and borne in dense panicles. This common native perennial is well worthy of a place in any border.

93. *Spiræa astilboides.*—Astilbe-like Spiraea (Japan). Height, 2 feet. In bloom fourth week of June. Flowers, small, white, very numerous, and borne in many branched panicles. Both foliage and flowers of this species are ornamental.

*94. *Spiræa Filipendula.*—Dropwort (Europe). Height, 2 to 3 feet. In bloom third week of June. Flowers, pure white, borne profusely in loose panicles. The foliage of this species is also very fine. There is a double flowered variety which is very effective.

95. *Spiræa palmata elegans.*—(Japan). Height, 2 to 3 feet. In bloom first week of July. Flowers, whitish with crimson anthers, borne very profusely in panicles. A fine species.

96. *Spiræa Ulmaria.*—Meadow sweet (Europe). Height 3 to 4 feet. In bloom second week of July. Flowers, very numerous, dull white, borne in large compound heads, having a soft, feathery appearance. A vigorous grower and a very striking species.

*97. *Spiræa venusta.*—Queen of the prairie. Native country unknown. Height, 4 feet. In bloom second week of July. Flowers, small, bright pink, borne profusely in large panicles. A very pretty pink flowered spiraea.

98. *Statice latifolia.*—Broad-leaved sea lavender (Bulgaria). Height, 1½ feet. In bloom first week of July. Flowers, small, blue, borne very profusely in loose panicles. Very effective in the border.

99. *Thalictrum aquilegifolium.*—Columbine rue (Europe). Height, 4 to 5 feet. In bloom fourth week of June. Flowers, small, white to purplish, very numerous and borne in large panicles. Very ornamental.

100. *Trollius europæus.*—Common globe flower (Europe). Height, 1½ to 2 feet. In bloom fourth week of May. Flowers, large, bright yellow. A very pretty plant, somewhat resembling a buttercup and continuing in bloom for a long time.

ORNAMENTAL GROUNDS.

The laying out and planting of the ornamental grounds is now almost complete. The work has covered a period of ten years, during which interval all the time available both in spring and autumn has been utilized to bring about the present results. The road from the main entrance to the office building which, when the work was begun in 1889, had nothing along its margins to vary the landscape save the fields of grain, is now at all seasons of the year brightened by the clumps of trees and shrubs which are grouped and scattered along its borders. The roads leading to the other buildings have also been planted in like manner, while the intervening areas are broken by lawns, flower borders, and flower beds. Some parts of the lawns now look quite park-like where such trees as pine, spruce, birch, larch, and other quick-growing sorts have been distributed singly over the grassy sward. Many of these are now more than twenty feet in height, and are excellent examples of the rapidity with which such trees grow when properly cared for.

FLOWER BORDERS AND FLOWER BEDS.

The roses which in June are always attractive were better in 1897 than last year, being less injured by the winter. The flower borders and beds were well stocked as usual and there was a splendid display of bloom throughout the season. A new feature

this year was the hydrangea bed, where 58 specimens of this beautiful shrub were planted, and produced during the latter part of July and August a fine mass of bloom.

VISITORS.

This year the number of notable visitors to the farm was much greater than at any time during the past, among them being many representatives of both the British Association for the Advancement of Science and the British Medical Association. All seemed pleased with the general appearance of the ornamental grounds, and many expressed their surprise at the growth the trees and shrubs had made in so short a time. Many farmers and farmers' wives, who came on the special excursions which were arranged for from time to time throughout the summer, expressed much interest in the trees, shrubs, and flowers, and it is hoped that some of them will, from seeing the effects of the judicious planting near the houses, spend more time in the beautifying of their own homes. The ladies were especially interested in the flowers and the names of those they admired most were often taken with the intention of procuring some of the desirable sorts for themselves.

The splendid example which the ornamental grounds now affords to all who can visit them, will, it is hoped, bear abundant fruit by inciting a greater desire to make the homes of our people more attractive.

CARE OF THE ORNAMENTAL GROUNDS.

The work in connection with the care of the ornamental grounds is now very considerable as the trees, shrubs, hedges, flower borders, flower beds, lawns and roads must all be kept in good order. Throughout the summer the grounds at all times looked well. The first work was done with the pony lawn mower on the 10th of May and the grass was kept cut at intervals with it until the 18th of September. The weeds in the flower borders and beds were also kept well in subjection. The surface soil about the trees and shrubs was stirred at intervals throughout the summer both to kill weeds and keep the soil from baking. Some thinning of the original planting of trees and shrubs along the main avenue, was done this year as a number of them were already crowding each other. During the summer many trees and shrubs were sprayed to prevent the depredations of insects and fungous diseases. Aphides were especially troublesome.

ADDITIONS TO TREES, SHRUBS AND LAWNS.

Very little planting of trees and shrubs was required on the ornamental grounds this year. In some places, however, clumps were widened by the addition of new specimens and those replaced which had died during the winter. The piece of ground north of the poultry building which was planted last year, was seeded down this summer also that on both sides of the avenue leading from the northern entrance to the farm foreman's house.

HEDGES.

Visitors to the Central Experimental Farm are often surprised at the number and variety of the trees and shrubs used for hedge purposes, and they manifest much interest in them by asking questions regarding the best varieties to plant and the methods of growing them. Examples of 88 species and varieties are now growing side by side in hedges 50 feet in length and 10 feet apart, which present a very fine appearance in summer when in full leaf.

The methods to be adopted in growing a hedge successfully are simple, but should be followed if a compact and regular hedge is to be obtained. The young trees or shrubs should be planted in good soil, and if it is not good it should be removed and better

earth brought in its place. Young stock from one to two feet in height should be planted and all cut back to a regular height of from ten to twelve inches. Evergreens should be procured as compact as possible at the base, for if they are loose and the foliage wanting it takes them a long time to thicken. The roots should not become dry from the time the shrubs are dug until they are re-planted in the hedge-row. Planting is done by opening a trench about a foot wide and placing the hedge plants 15 inches apart in a single row. The trench should be filled with good soil pressed firmly against the roots. Afterwards the surface soil should be kept loose for about two feet on each side of the hedge throughout the summer, and every following season. If the trees or shrubs are cut back when planted they will need no further clipping the first season, but after that, hedges of most deciduous trees and shrubs require to be clipped twice a year, in the latter part of June and again in August. Regular pruning from the beginning is very essential to successful hedge growing.

The following thirteen trees and shrubs, after several years' test, have proven the most satisfactory for hedge purposes of all those yet tested at the Central Experimental Farm :—

1. *Berberis Thunbergii.*—Thunberg's barberry. This makes a beautiful dwarf compact hedge with bright green leaves in summer becoming in autumn very highly coloured with red. The scarlet fruit which is produced abundantly makes it quite ornamental throughout the winter. It is a very satisfactory shrub where a low growing hedge is desired. Planted in 1890, this hedge is now 3 feet 4 inches in height and 4 feet 3 inches in width.

2. *Caragana arborescens.*—Siberian pea-tree. One of the hardiest shrubs grown and very useful for hedge purposes in the colder parts of Canada. It is a vigorous quick growing shrub whose delicate green leaves open very early in the spring and are quite attractive throughout the summer. The bright yellow, pea shaped blossoms also add to the beauty of this hedge. As the Siberian pea-tree makes all its growth in the early part of the summer one pruning each year is sufficient. A hedge of this shrub, planted in 1889, is now 6 feet in height and 5 feet 3 inches in width.

3. *Viburnum Opulus.*—Guelder rose. This is a native shrub which has made one of the most ornamental hedges yet tested here. The bright green leaves, large clusters of pure white flowers, and scarlet fruit make it very attractive most of the year. Planted in 1894, this hedge is now 3 feet 6 inches in height and 3 feet 3 inches in width.

4. *Syringa Josikæa.*—Josika's lilac. The firm, glossy, deep green leaves of this lilac make it more suitable for hedge purposes than the common species. It makes a very neat, compact hedge and as most of the growth is made in the early part of the season, one clipping each year is sufficient to keep it in good order. Planted in 1891, this hedge is now 4 feet 8 inches high and 4 feet 10 inches wide.

5. *Viburnum Lantana.*—Wayfaring tree. This shrub has made a very attractive hedge. It is a neat compact grower with large, rough, pale green leaves and large clusters of white flowers, succeeded by scarlet berries which turn dark purple when ripe. Planted in 1890, its present height is 4 feet 1 inch with a width of 4 feet 7 inches.

6. *Ligustrum amurense.*—Amur privet. This is the only privet yet tested at Ottawa which has proven perfectly hardy. As the privet is very largely used in Great Britain for hedge purposes, it will be especially welcomed by English people settling in Canada. It is a pretty shrub with dark green leaves and forms a very compact hedge. Planted in 1894, its present height is 3 feet 1 inch, with a width of 3 feet 3 inches.

7. *Rhamnus Frangula.*—Alder buckthorn. A rapid growing shrub which makes a firm compact hedge. Its glossy green leaves make it quite ornamental, and where a tall growing deciduous hedge is desired this is one of the best. The flowering period of this shrub extends over a period of five or six weeks, and during that time it is a favourite haunt of the honey bee. Planted in 1890, this hedge is now 5 feet 10 inches in height and 6 feet in width.

EVERGREENS.

8. *Thuya occidentalis.*—American Arbor-vitae. This is the most satisfactory evergreen tested here for hedge purposes. It is a native tree and quite common in many parts of Canada, growing in a great variety of soils which render it very suitable for hedges. Its neat, compact appearance and bright green leaves make it very ornamental in summer, while in winter, although the leaves are duller, it yet remains quite attractive. In 1888 and 1889 more than one mile of this tree was planted at the Central Experimental Farm, as a hedge, which is now very compact and about 6 feet in height. The sample hedge planted in 1890 is now 4 feet in height and 4 feet 7 inches in width. The American arbor-vitae requires only one clipping each year which is best done in August.

9. *Thuya occidentalis aurea Douglasii.*—Douglas' Golden Arbor-vitae. This beautiful golden leaved evergreen is highly recommended for those who desire a golden tinted species for hedge purposes. It has formed one of the most beautiful hedges tested here, being of a bright yellow colour which makes a fine contrast with the green of other hedges. Planted in 1894, this hedge is now 2 feet 4 inches in height and 2 feet in width.

10. *Picea excelsa.*—Norway spruce. The Norway spruce makes a compact, firm, handsome hedge, and is ornamental at all seasons of the year but as it is a very vigorous grower it requires severer clipping than some others to keep it from growing too large; planted in 1889 this hedge is now 5 feet 3 inches in height, and six feet 8 inches in width.

11. *Picea alba.*—White spruce. This native evergreen is not so rapid a grower as the Norway spruce, and does not require as much clipping. It makes a very handsome compact hedge with a better colour than the Norway spruce. Planted in 1889, this hedge is 4 feet in height, and 5 feet 1 inch in width.

12. *Pinus Strobus.*—White pine. Although a little irregular and loose when planted, this native tree has made a beautiful compact hedge. It is soft and yielding to the touch and would not be valuable where a firm hedge is desired. The leaves remain a lively green throughout the winter making it very ornamental all the year.

13. *Picea pungens glauca.*—Rocky Mountain blue spruce. The blue spruce makes one of the most beautiful evergreen hedges grown. Its colour is pale steely blue which produces a fine contrast with a green lawn. It is a slow growing tree and makes a very neat compact hedge, requiring little clipping. Planted in 1891, it is now 3 feet in height and 3 feet 3 inches in width. As this tree varies in colour from green to blue, in procuring hedge plants, the blue variety should be ordered.

A word of caution in regard to the honey locust (Gleditschia triacanthos) is here given to intending hedge planters. While this tree, undoubtedly, makes a very ornamental and useful farm hedge in certain parts of Ontario; at Ottawa, all specimens have not proven hardy; the result being that the hedge is broken and uneven. Furthermore as this is a very vigorous tree making strong growth throughout most of the summer it is difficult to keep it looking well without frequent clipping and if not kept well cut back will soon become quite tree like. The hawthorns which grow in eastern Ontario and Quebec are much hardier, will hold cattle nearly as well and require much less pruning. A hedge of the downy leaved hawthorn (Crataegus tomentosa) planted here in 1891 is now 5 feet 4 inches in height and 4 feet in width. The scarlet fruited hawthorn (Crataegus coccinea) should make a very handsome hedge, as the leaves are glossy and ornamental.

LIST OF HEDGES AT THE CENTRAL EXPERIMENTAL FARM.

Name.	When Planted.	Height, 1897.		Greatest Width, 1897.	
		Ft.	In.	Ft.	In.
Abies balsamea—Balsam fir	1897	0	11	1	0
Acer glabrum—Smooth maple	1895	1	11	1	4
Acer pennsylvanicum—Striped maple	1897	1	0	Has not branched.	
Acer tataricum Ginnala—Ginnalian maple	1894	3	3	3	9
Alnus viridis—Green alder	1896	1	6	1	6
Artemisia Abrotanum—Southern wood	1896	3	4	3	0
Artemisia Abrotanum tobolskianum—Russian Southern wood	1896	3	0	3	5
Berberis Thunbergii—Thunberg's barberry	1890	3	4	4	3
Berberis vulgaris—Common barberry	1889	5	5	6	1
Berberis vulgaris purpurea—Purple-leaved barberry	1889	5	2	5	10
Betula lutea—Yellow birch	1895	3	2	2	6
Betula papyrifera—Canoe birch	1895	3	0	2	7
Betula populifolia—White birch	1897	2	0	1	2
Betula nigra—Black birch	1897	1	1	1	0
Calycanthus floridus—Carolina allspice	1895	1	3	0	6
Caragana arborescens—Siberian pea-tree	1889	6	0	5	3
Caragana frutescens—Woody caragana	1896	1	4	0	6
Celtis occidentalis—Nettle tree	1891	4	0	4	9
Cornus alba—White dog-wood	1897	1	0	0	6
Cornus Amomum	1897	1	5	0	8
Cornus alba sibirica variegata—Variegated Siberian dog-wood	1895	1	8	1	10
" " " "	1896	2	0	1	7
Cotoneaster acutifolia—Sharp-leaved cotoneaster	1895	1	8	1	8
Cotoneaster vulgaris—Common cotoneaster	1896	1	6	1	4
Crataegus tomentosa—Downy leaved hawthorn	1890	5	4	4	0
Cupressus ericoides—Heath-like retinospora	1896	1	5	1	6
Cytisus biflorus—Twin-flowered cytisus	1891	3	3	3	0
Diervilla Sieboldii variegata—Variegated weigelia	1896	1	8	1	8
Elæagnus angustifolia—Russian olive	1894	4	0	4	9
Euonymus americanus	1897	1	0	0	3
Fagus ferruginea—American beech	1897	0	6	0	3
Fagus sylvatica—European beech	1895	1	10	....	
Gleditschia triacanthos—Honey locust	1889	4	6	4	7
Hippophæ rhamnoides—Sea buckthorn	1895	2	10	2	6
Juniperus communis suecica compacta	1897	0	6	0	6
Juniperus communis fastigiata—Irish juniper	1891	3	10	3	7
Larix americana—Tamarac	1895	2	9	2	10
Larix europæa—European larch	1897	1	1	0	8
Ligustrum amurense—Amur privet	1894	3	1	3	3
Lonicera tatarica—Tartarian honeysuckle	1896	2	0	1	4
Lonicera tatarica elegans—Elegant tartarian honeysuckle	1896	1	11	1	10
Morus tatarica—Russian mulberry	1889	6	8	6	11
Neillia aubifolia	1896	2	5	2	10
Neillia opulifolia aurea—Golden-leaved spiræa	1890	5	8	5	10
Negundo aceroides—Box elder	1891	5	7	6	4
Philadelphus coronarius aureus—Golden-leaved mock orange	1894	2	9	2	7
Philadelphus coronarius primulæflorus—Double-flowered mock orange	1894	1	8	1	9
Picea alba—White spruce	1889	4	0	5	1
Picea excelsa—Norway spruce	1889	5	3	6	8
Picea pungens—Rocky Mountain blue spruce	1891	3	0	3	3
Pinus Cembra—Swiss stone pine	1894	1	7	1	0
Pinus ponderosa—Bull pine	1895	2	7	2	6
Pinus Strobus—White pine	1890	4	0	4	4
Populus pyramidalis	1896	2	8	2	2
Populus nigra fastigiata—Lombardy poplar	1897	2	3	1	0
Prunus americana—Wild plum	1894	4	2	4	0
Prunus Mahaleb—Mahaleb cherry	1897	1	6	0	8
Prunus serotina—Wild black cherry	1897	2	0	0	10
Pseudotsuga Douglasii Douglas fir	1894	2	3	2	5
Pyrus baccata aurantiaca—Yellow Siberian crab	1897	1	8	0	6
Pyrus Maulei—Maule's Japanese quince	1894	1	0	1	7
Pyrus communis—Wild pear	1897	1	1	0	4
Quercus Robur—Common European oak	1895	2	3	2	4
Rhamnus catharticus—Cathartic buckthorn	1895	3	6	2	6
Rhamnus Frangula—Alder buckthorn	1890	5	10	6	0
Rhamnus Frangula—(Dense form)—Dense alder buckthorn	1895	3	0	3	3
Rosa rubrifolia—Red-leaved rose	1890	5	5	4	5
Rosa rugosa—Japan rose	1890	4	5	5	3

LIST OF HEDGES AT THE CENTRAL EXPERIMENTAL FARM—*Continued.*

Name.	When Planted.	Height, 1897.		Greatest Width, 1897.	
		Ft.	in.	Ft.	in.
Salix acutifolia—Sharp-leaved willow	1896	1	11	2	0
Shepherdia canadensis—Buffalo berry	1897	1	2	0	6
Spiræa chamaedrifolia—Germander-leaved spiræa	1896	2	5	1	3
Spiræa Douglasii—Douglas' spiræa	1891	3	10	2	7
Spiræa bracteata (media rotundifolia)—Round-leaved spiræa	1894	2	6	2	7
Spiræa Van Houttei—Van Houtte's spiræa	1891	2	2	1	10
Symphoricarpus racemosus—Snowberry	1890	3	0	3	8
Syringa chinensis—Rouen lilac	1890	3	3	3	7
Syringa Josikæa—Josika's lilac	1891	4	8	4	10
Syringa vulgaris—Common lilac	1890	6	6	6	3
Thuya occidentalis—American arbor-vitæ	1890	4	0	4	7
Thuya occidentalis aurea Douglasii—Douglas' golden arbor-vitæ	1894	2	4	2	0
Thuya occidentalis aurea Hoveyi—Hovey's golden arbor-vitæ	1897	1	1	0	6
Thuya occidentalis globosa—Globose arbor-vitæ	1895	1	6	1	8
Thuya occidentalis warcana—Siberian arbor-vitæ	1895	2	5	2	5
Tsuga canadensis—Hemlock	1889	3	0	3	8
Ulmus americana—American elm	1889	6	1	5	4
Viburnum Lantana—Wayfaring tree	1890	4	1	4	7
Viburnum Opulus—High bush cranberry	1894	3	6	3	3
Xanthoxylum americanum—Prickly ash	1889	4	6	4	2

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES

(REPORT OF G. W. FORREST, SUPERINTENDENT.)

NAPPAN, N.S., November 30, 1897.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the following report of the operations on the Experimental Farm for the Maritime Provinces, at Nappan, N.S., during the year 1897.

WEATHER.

December, 1896, opened rainy, followed by cold on the 2nd. The thermometer registered 12° of frost on the morning of the 3rd, this weather continued with one exception until the 21st, when the thermometer registered 22° of frost, and on the morning of the 22nd the mercury had fallen to 4° below zero; this weather continued for a few days. Some snow fell on the 8th, and about five inches on the 17th, but not sufficient to make sleighing.

January opened cold, the thermometer registered 13° of frost; on the 4th open weather set in with rain, which continued until the 8th, when we had 22° of frost. On the 14th the mercury fell to 17° below zero, and on the 15th 10° below. On the 17th and 18th we had open weather without any frost, and on the 19th the register showed 14° below zero, continuing cold during the remainder of the month. A slight amount of snow fell on the 9th, with a heavy fall and high winds on the 12th. Again on the 29th we had a heavy fall of snow, accompanied by high winds.

February was an unusually fine, open month, having no very cold weather. On the 15th and 16th of March the thermometer registered 24 and 30° of frost, with this exception March weather was rather pleasant. April was rather fine with the exception of rain on the 14th, 24th and 27th. The month was, however, rather cold, making the spring backward.

May opened with cold, east winds, and rain on the 3rd. The whole month continued more or less cold and wet. The first seed was sown on the 8th.

From the 12th to the 20th of May we had almost continuous rain. Rain to the depth of 4·01 inches fell between the 27th of April and 1st June; 3·78 inches rain fell in June; 3·35 inches in July; 3·67 inches in August and 2·05 inches in September.

The whole season was unusually dark and wet until the 20th of September, since then the weather has been exceptionally fine. The first frost this fall was on the 18th of September, it was only light, followed by a heavy one on the 29th.

HAY.

Hay was over an average crop on both upland and marsh. Some 20 acres of upland was in hay, giving a yield of 50 tons. Forty acres of the marsh lands produced 70 tons of English and 12 tons of broad-leaf hay, making a total of 120 tons of mixed hay and 12 tons of broad-leaf. Although the season was unfavourable for making hay, on account of considerable rain and very little sunshine, the hay was all gathered in a fair condition.

In addition to the hay crop the straw harvested amounted to 49 tons 805 pounds.

EXPERIMENTS WITH SPRING WHEAT.

The experimental plots of spring wheat consisted of forty varieties. The yield was hardly up to the average, the straw was all more or less rusted. The soil used for the experiment was a clayey loam, the previous crop being roots. Fertilizer at the rate of 250 pounds per acre was used, it was made up of 125 pounds complete fertilizer and 125 pounds of bone meal mixed together. This was drilled in with the seed. In addition to this, 100 pounds of nitrate of soda was used per acre, 50 pounds sown broadcast when the grain was 3 inches high, and 50 pounds when 6 inches high. No beneficial results were noticeable from the use of nitrate of soda; this was probably due to the wet season. The straw making an abnormal growth consequently lodged badly, and the seed did not fill out well.

The plots were one-twentieth acre each. The seed was sown on the 10th and 11th of May, at the rate of 1¾ bushels per acre. The results obtained are given in the following table:—

WHEAT—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush	Lbs	Lbs.
Wellman's Fife	Aug. 28	108	48	Very stiff.	5	Beardless.	5,850	30	20	60
White Connell	" 30	111	44	Medium	4	"	5,200	28	20	61
Rio Grande	Sept. 1	113	46	"	4	Bearded	5,000	27	40	60
Advance	Aug. 24	106	44	Stiff	3	"	5,700	26	40	60
Goose	" 25	107	41	Medium	2½	"	5,000	26	40	62
Red Fern	" 25	107	45	Weak	4	"	4,700	26	40	61
White Russian	Sept. 1	113	46	Medium	4	"	5,200	26	40	58
Preston	Aug. 24	106	43	"	3½	"	5,200	26	20	61
Dion's	" 30	111	45	Stiff	3½	"	4,800	26	00	58
Stanley	" 24	106	44	Medium	3	Beardless.	4,500	25	40	61
Admiral	" 28	110	47	Stiff	4	"	4,000	25	00	59
Vernon	" 28	109	44	Weak	3	Bearded	5,000	23	20	60
Green Mountain	Sept. 1	113	48	Medium	4	Beardless.	4,600	23	20	58
Huron	Aug. 30	111	44	Stiff	3¾	Bearded	4,400	23	20	61
Monarch	" 30	111	48	"	4½	Beardless.	5,800	23	20	58
Alpha	" 26	106	47	"	3	Bearded	4,200	23	20	61
Colorado	" 25	107	44	Weak	3	"	4,700	23	20	62
Beauty	Sept. 1	113	45	Stiff	3½	Beardless.	5,000	23	20	60
Dufferin	Aug. 27	109	46	Weak	3	Bearded	3,800	22	40	62
Emporium	" 30	111	43	Stiff	3½	"	4,500	22	40	58
Crown	" 30	111	42	Medium	3½	"	4,000	22	00	62
Captor	Sept. 1	113	48	Stiff	3½	Beardless.	4,400	22	00	62
Herisson Bearded	Aug. 28	109	48	Weak	2	Bearded	4,600	22	00	60
Golden Drop	" 24	106	44	Stiff	3¾	"	5,000	22	00	61
Dawn	" 27	109	47	"	3	Beardless.	4,000	22	00	60
Black Sea	" 27	109	50	"	3	Bearded	4,300	21	40	62
Blenheim	Sept. 1	113	48	Very stiff.	3½	"	4,400	21	00	60
Old Red River	Aug. 30	111	48	Medium	4	Beardless.	5,000	21	00	60
Red Fife	Sept. 1	113	38	Very stiff.	3½	"	4,300	21	00	60
Hungarian	" 1	113	42	Medium	4	Bearded	4,900	20	40	59
Beaudry	Aug. 30	111	37	Weak	3	"	3,900	20	20	58
Campbell's White Chaff	" 25	107	43	Stiff	3	Beardless.	4,500	20	20	61
Pringle's Champlain	" 30	111	48	"	4	Bearded	4,900	19	00	59
Gehun	" 27	107	38	Medium	3½	Beardless.	4,060	18	40	58
Rideau	" 27	109	42	"	3	"	4,000	18	40	56
Progress	Sept. 1	113	48	"	4½	"	5,600	18	40	61
White Fife	" 1	113	46	Stiff	3¼	"	4,500	18	20	60
Ladoga	Aug. 23	105	40	"	3	Bearded	4,000	18	00	61
Percy	" 30	111	48	Medium.	3½	Beardless.	4,300	17	40	60
Countess	Sept. 1	113	46	Stiff	3	"	3,700	17	00	61

NOTE.—The weights given here, and also in all other grain tables in this report, were taken as the grain came from the threshing mill, and are not the maximum weights that the grain could be brought to by cleaning.

EXPERIMENTS WITH BARLEY.

The test plots of barley included twenty-one varieties of six-rowed and sixteen of two-rowed.

The grain was up to the average in yield. The land used for these plots was a sandy loam, the previous crop being beans and corn. Fertilizer of similar composition to that used on the wheat plots was applied in the same manner, an equal amount per acre being used. In addition to this 500 pounds per acre of common salt was used for the purpose of checking the growth of weeds. On the six-rowed sorts the salt was sown broadcast and harrowed in before seeding; on the two-rowed varieties it was sown broadcast when the grain was two inches high. There was no noticable difference in its value as a preventive of weeds between the two modes of application. The straw was all unusually bright and free from smut. The salt to all appearances was very beneficial in this respect.

The seed was sown on May 25th and 26th in one-twentieth acre plots, at the rate of two bushels per acre. The following results were obtained :—

Six-rowed Barley—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Bush.	Lbs.	Lbs.
Mensury	Aug. 23..	90	39	Weak	2¾	7,800	52	4	50
Oderbruch	" 23..	90	36	Medium	2½	7,600	50	20	50
Royal	" 18..	85	36	"	3	6,100	48	16	48
Vanguard	" 18..	42	42	Stiff	2½	6,700	46	32	48
Odessa	" 19..	86	43	Medium	3	4,500	46	12	48
Petschora	" 17..	84	43	Stiff	2½	4,700	45	20	44
Pioneer	" 19..	86	38	"	2½	4,500	44	8	50
Common Six-Rowed	" 23..	90	36	Medium	2¼	7,600	42	24	50
Blue	" 21..	88	36	"	3	5,000	42	24	43
Rennie's Improved	" 19..	86	38	Very stiff	2	5,000	40	40	51
Phœnix	" 18..	85	42	"	2	5,000	40	20	49
Surprise	" 27..	94	36	Stiff	2½	5,100	40	00	51
Trooper	" 27..	94	40	Medium	2¾	5,000	40	00	51
Nugent	" 27..	94	35	Stiff	2¾	4,600	39	28	51
Summit	" 27..	94	42	Medium	4	5,300	38	36	51
Stella	" 27..	94	36	"	3	5,400	38	36	48
Champion	" 18..	85	48	Stiff	3	6,500	37	44	43
Baxter's Six-Rowed	" 19..	86	42	Very stiff	2½	4,500	37	20	50
Excelsior	" 23..	90	48	Stiff	2	6,500	37	20	42
Success	" 13..	80	46	"	2½	6,000	34	28	45
Silver King (Four-Rowed)	" 20..	87	36	Medium	3½	6,500	41	32	48

Two-rowed Barley—Test of Varieties.

Duck-bill	Sept. 6..	103	39	Stiff	3	5,900	41	32	51
Canadian Thorpe	" 6..	103	42	Very stiff	3	5,600	40	40	49
Newton	" 7..	104	43	Medium	3½	5,500	40	40	51
Nepean	" 7..	104	43	"	3½	5,400	40	40	51
Danish Chevalier	" 7..	104	36	Stiff	4½	5,200	39	28	47
Sidney	" 7..	104	42	Medium	4	5,600	38	16	50
Bolton	" 7..	104	36	Weak	3	4,700	37	24	49
Pacer	" 7..	104	38	Stiff	3	5,200	37	4	51
Victor	" 7..	104	36	"	4½	6,000	35	40	50
French Chevalier	" 7..	104	29	Medium	4½	5,100	35	40	50
Beaver	" 7..	104	38	Weak	4	4,500	34	28	51
Prize Prolific	" 7..	104	39	Stiff	4	5,000	34	8	50
Kinver Chevalier	" 7..	104	29	"	4½	4,900	32	44	50
Thanet	" 7..	104	36	Medium	5	3,500	29	8	49
Monck	" 7..	104	42	Stiff	3½	6,800	23	36	51
Rigid	" 7..	104	38	"	4	5,500	21	32	51

EXPERIMENTS WITH OATS.

The soil used for these experiments was a clayey loam, the previous crop being corn. The application, quantity per acre, and quality of the fertilizer used was similar to that of the wheat and barley plots. The straw was all more or less rusted, and of a very heavy growth, due no doubt to the stimulating effect of the nitrate of soda. The seed, however, filled out well.

Some of the varieties which were affected with smut the previous year were treated, by putting the seed to be sown in water raised to the temperature of 142° F., allowing it to remain submerged for two minutes, then cooling it off rapidly and drying. Those plots so treated were entirely free from smut. Some smut was noticeable in many of the other plots.

Sixty-four varieties of oats were sown on May 12th and 20th in plots of one-twentieth acre each. The following table gives the results obtained :—

OATS—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush	Lbs	Lbs.
Wallis	Aug. 26..	98	46	Stiff	10	Branching	1,600	87	22	39
Siberian O. A. C	Sept. 6..	109	42	Medium..	8	" ..	5,100	82	12	33
Flying Scotchman	Aug. 21..	93	44	Very stiff.	5	" ..	6,800	82	12	40
Hazletts Seizure	" 21..	93	46	Stiff	13	" ..	6,600	78	22	37
White Wonder	" 21..	93	42	Medium..	10	" ..	6,000	76	16	42
White Russian	" 26..	106	40	Weak	9	" ..	6,800	73	18	37
Bavarian	" 27..	99	40	Stiff	8	" ..	6,800	72	12	36
Golden Tartarian	Sept. 13..	116	42	"	12	Sided	7,000	72	12	32
Improved American	" 6..	109	45	"	11	"	6,800	72	12	32
Mortgage Lifter	" 2..	105	40	Medium..	13	Branching	6,100	69	14	38
California Prolific (Blk)	Aug. 30..	102	44	Stiff	9	Sided	5,800	67	22	39
Columbus	Sept. 4..	107	42	"	12	Branching	4,900	67	2	36
Mennonite	" 1..	104	36	"	9	" ..	6,400	67	2	32
Early Etampes	" 4..	115	39	Medium..	8	" ..	5,000	67	2	35
Doncaster Prize	Aug. 26..	98	46	Stiff	12	" ..	7,900	65	30	39
White Monarch	" 26..	98	46	"	9	" ..	7,700	64	24	40
Early Racehorse	" 25..	97	41	Medium..	10	" ..	6,500	64	24	41
Lincoln	" 26..	98	39	" ..	9	" ..	5,000	64	24	36
American Beauty	Sept. 2..	105	40	" ..	8	" ..	5,100	64	24	32
Rosedale	Aug. 27..	107	37	Stiff	9	Sided	5,300	64	4	41
Early Gothland	" 27..	99	36	"	9	"	5,300	64	4	40
Cream Egyptian	" 26..	98	41	Medium..	10	"	6,700	62	32	39
Oderbruch	Sept. 4..	107	40	" ..	11	Half-sided	5,600	62	32	35
Abyssinia	Aug. 30..	102	45	Stiff	10	Sided	4,900	62	32	38
Golden Beauty	Sept. 4..	107	40	Medium..	11	Branching	5,100	61	26	32
Wide Awake	Aug. 30..	110	42	Stiff	9	" ..	5,800	61	26	32
Prize Cluster	" 26..	106	41	"	11	" ..	4,800	61	26	42
Welcome	" 26..	106	46	"	13	" ..	4,700	61	26	41
Newmarket	Sept. 2..	105	42	"	10	" ..	4,800	61	26	33
Banner	Aug. 27..	107	38	"	8	" ..	4,200	60	30	38
Olive	" 27..	107	42	Medium..	12	Sided	3,500	60	00	37
Master	" 26..	98	44	Stiff	13	Branching	4,600	59	14	38
Early Blossom	" 30..	110	40	"	10	Sided	4,800	59	14	36
Winter Grey	Sept. 1..	104	42	Medium..	12	Branching	4,700	58	38	38
Black Beauty	Sept. 2..	105	32	Weak	13	Branching	6,100	57	22	33
Improved Ligowo	Aug. 27.	107	35	Stiff	8	" ..	4,200	57	22	34
Coulommiers	Sept. 4..	115	40	"	10	" ..	7,500	56	16	35
Holstein Prolific	Aug. 27..	107	35	"	8	" ..	4,000	55	30	35
Prolific Black Tartarian	" 30..	110	42	"	10	Sided	5,700	55	10	34
$1,000	Sept. 1..	104	42	Medium..	8	Branching	3,800	55	10	33
Pense	Aug. 27.	107	40	" ..	12	Sided	3,500	55	10	34
Golden Giant	Sept. 13..	117	42	Stiff	12	"	6,400	53	18	35
Abundance	Aug. 27..	99	42	"	8	Branching	4,100	53	18	35
Scotch Hopetoun	Sept. 4..	107	47	"	10	" ..	7,000	53	18	35

OATS—Test of Varieties—*Concluded.*

Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush	Lbs	Lbs.
Medal	Sept. 4	107	38	Medium	10	Branching	4,900	52	32	35
Bonanza	Aug. 27	107	43	Stiff	11	"	4,000	52	32	41
Siberian	Sept. 6	109	44	Very stiff	10	Sided	6,500	52	32	34
Rennie's Prize	Aug. 26	98	42	Stiff	10	Branching	5,100	51	26	42
Poland White	" 21	93	46	Medium	12	"	4,800	51	26	42
Early Golden Prolific	" 27	107	37	"	7	"	5,100	51	26	40
Cromwell	Sept. 4	107	46	Stiff	10	"	5,000	50	00	34
Joanette	" 4	115	38	Medium	7	"	5,200	50	00	40
White Schonen	Aug. 26	106	37	Weak	7	"	6,500	50	00	42
Early Maine	" 30	102	40	"	11	Half-sided	3,300	50	00	38
Imported Irish	" 26	98	46	"	10	Branching	4,800	49	14	42
Brandon	Sept. 1	103	37	Stiff	9	Half-sided	5,700	48	28	36
Russell	Aug. 27	99	39	"	8	Branching	4,800	48	28	40
Scottish Chief	" 27	107	38	"	11	"	2,900	47	22	40
Miller	Sept. 4	107	49	Very stiff	12	"	7,400	45	30	34
Buckbee's Illinois	" 7	110	48	Medium	8	"	6,400	44	4	34
American Triumph	" 4	107	48	Very stiff	14	"	6,000	44	4	37
Victoria Prize	Aug. 30	110	38	Medium	10	"	2,800	44	4	42
Oxford	Sept. 7	110	48	Stiff	9	"	5,500	40	00	35
Early Archangel	" 1	104	42	Medium	13	"	4,500	40	00	36
King	Aug. 27	107	42	"	12	"	5,400	40	00	42

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

Experiments to test the relative value of early, medium and late sowings of grain were again carried on this year. The first set of these plots was sown 19th May, and the sowings were continued until six had been made, one week apart. One variety each of wheat, barley and oats were used in this test. The soil on which these experiments were conducted was a clayey loam. Fertilizer at the rate of 250 pounds per acre, made up of 125 pounds of complete fertilizer and 125 pounds of bone meal, mixed together, was drilled in with the seed when sown.

Owing to the lateness of the season when the last set of plots were sown, and the early frost this fall, the three last sowings of wheat, and the last plot of oats and barley, did not mature. The first plots sown were slightly rusted, the later sown ones were all badly rusted. The plots were one-twentieth acre each. The results are as follows :—

OATS—Results of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Yield per Acre.		Weight per Bushel
		Bus.	Lbs.	Lbs.
No. 1—Abundance	May 19	61	26	32
No. 2— "	" 26	48	8	35
No. 3— "	June 2	54	4	35
No. 4— "	" 9	59	12	32
No. 5— "	" 16	56	8	32
No. 6— "	" 23	44	24	29

BARLEY—Results of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Yield per Acre.		Weight per Bushel
		Bus.	Lbs.	Lbs.
No. 1—Canadian Thorpe	May 19	52	44	48
No. 2— "	" 26	34	28	47
No. 3— "	June 2	46	12	51
No. 4— "	" 9	55	25	46
No. 5— "	" 16	53	35	47
No. 6— "	" 23	40	40	45

WHEAT—Results of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Yield per Acre.		Weight per Bushel
		Bus.	Lbs.	Lbs.
No. 1—Stanley	May 19	19	20	60
No. 2— "	" 26	18		57
No. 3— "	June 2	18	20	55
No. 4— "	" 9	18	20	52
No. 5— "	" 16	16	40	47
No. 6— "	" 23	15	20	45

EXPERIMENTS WITH PEASE.

Forty varieties of pease were sown 16th May, on one-twentieth acre plots. The same land devoted to the experimental plots of pease last year was again used. It was of a rather light clay loam and very poor.

The cut worm did a great amount of damage to these plots in some cases fully one-half the plants were cut off when about 3 inches high.

Fertilizers at the rate of 250 pounds per acre was used, this was made up of 125 pounds of complete fertilizer and 125 pounds of bone meal mixed together, and sown with the seed. The results obtained are as follows :—

PEASE—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of days maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	Lbs.	In.		Bush.	Lbs.	Lbs.
Early Britain..........	Sept. 2..	109	Weak	78	4,800	2½	....	50	00	59
Crown	Aug. 28..	104	" ...	60	4,200	3	Small	35	00	61
Perth	Sept. 2..	109	"	72	4,000	2	.. ..	31	40	61
Centennial	" 16..	123	Medium....	84	4,200	2½	Medium..	31	40	59
King	" 9 .	116	Stiff.......	78	3,900	2	... .	31	40	60
Chancellor	" 2..	109	Medium....	72	3,900	2	....	30	00	61
Prussian Blue........	" 13..	120	Strong......	60	4,300	2	....	30	00	62
Oddfellow	" 9..	116	Medium....	48	3,900	1½	....	28	40	64
Bright.................	" 20..	127	"	50	3,100	2½	.. ..	26	40	62
Duke	" 16..	123	" .. .	70	3,500	2¼	Medium..	26	40	58
Vincent.......	" 9..	116	"	54	4,000	3	....	26	40	60
Elephant Blue	" 4..	111	Weak	60	2,400	2½	....	24	40	61
Archer.................	" 20..	127	Strong	55	2,600	2	....	24	00	61
White Wonder.........	" 2..	109	Very weak..	38	2,000	2	....	23	20	61
Nelson	" 4..	111	Medium....	45	3,400	2	....	23	20	60
Creeper	" 9..	116	Weak	66	3,900	2½	Small	22	40	59
Bruce..........	" 13..	120	Strong	75	3,600	2½	Medium..	22	20	60
Prince Albert...	" 16 .	123	"	96	3,500	2½	Small	22	20	63
Trilby.............. ...	" 16..	123	Medium....	72	4,200	2½	"	22	20	60
Victoria	" 16..	123	Strong......	55	3,400	2	....	22	00	60
Alma	Aug. 28..	104	Weak	32	3,300	2	....	22	00	62
New Potter......... ...	Sept. 9..	116	Medium....	72	4,500	2½	Medium..	22	00	60
Pride	" 13..	120	"	60	3,300	3	Large ...	21	40	63
Carleton	" 2..	109	"	72	3,900	2	Medium..	20	40	59
Large White Marrowfat.	" 13..	120	"	98	3,600	2½	" ..	20	40	57
Harrison's Glory........	" 4..	111	Weak	45	2,600	2	....	19	20	61
Prince	" 13..	120	Strong......	48	3,200	2½	Medium..	19	20	60
Multiplier	" 13..	120	Weak	60	2,600	2	Small	18	40	60
Mackay	" 13..	120	Strong......	65	3,000	2½	Medium..	18	20	58
Bedford	" 20..	127	"	55	2,600	2	" ..	17	20	62
Blackeyed Marrowfat...	" 4..	111	Weak	66	2,700	2½	Large	16	40	60
Mummy	" 28..	104	"	36	1,000	1½	Medium..	16	40	62
Macoun............ ..	" 16..	123	Strong.. ...	72	3,500	2	Large	16	40	60
Paragon	" 13..	120	Medium....	55	3,100	2½	Small	16	40	58
Golden Vine..........	" 9 .	116	Weak	48	4,000	1½	"	16	00	60
Canadian Beauty......	" 9..	116	"	44	3,100	2¾	Large	16	00	61
Kent	" 13..	120	"	70	2,500	2½	Medium..	15	00	58
Arthur......	Aug. 28..	104	"	32	1,000	2	Small	13	20	61
Daniel O'Rourke...... ..	" 28..	104	"	39	1,100	2	"	11	20	61
Agnes....	Sept. 4..	111	"	48	1,100	2½	Medium..	11	20	60

GENERAL STATEMENT OF GRAIN CROPS.

The grain plots yielded 412 bushels, 1¼ acre of oats on the marsh yielded 55 bush. 11 acres of oats on the upland yielded 330 bush. Corner lots of different areas sown to barley produced 83 bushels. Also corner lots of oats in different fields produced 22 bushels, 6 acres of buckwheat yielded 85 bushels. This makes a total of 987 bushels of grain harvested.

FERTILIZERS USED ON THE FIELD GRAIN.

The field oats were fertilized with 8 barrels of soft wood ashes and 1 barrel of complete fertilizer per acre. The grain fields were at the same time seeded to clover and it was noticed that the fields in which wood ashes were used gave the best crop of clover, as well as an apparent better crop of oats.

Part of the land used for buckwheat was fertilized with 8 barrels of soft wood ashes per acre. This was sown broadcast and harrowed in, and the other part with 250 pounds of mixed fertilizer (125 pounds bone meal and 125 pounds of complete fertilizer) per acre. The part on which the wood ashes were sown made the best growth and gave apparently the best yield.

EXPERIMENTS WITH TURNIPS.

Eighteen varieties of turnips were used in this experiment. The land was a sandy loam, the previous crop was potatoes. The land was ploughed in the fall.

Thirty 20-bushel cart loads of barn-yard manure, and 100 pounds of complete fertilizer were used per acre. After the rows were run up for seeding a small drill was made by hand into which the fertilizer was also sown by hand, the seed was then sown and covered. All the seed sowing is done by hand for the root plots.

Two sowings were made of each variety. The first set of plots were sown 4th June, the second two weeks later, 18th June. The yield of all the root plots per acre has been calculated from the quantity obtained from two rows each 66 feet long and 26 inches apart. The following results were obtained :—

TURNIPS.—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per acre. 1st Plot.		Yield per acre. 1st Plot.		Yield per acre. 2nd Plot.		Yield per acre. 2nd Plot.	
					Tons.	lbs.	Bush.	lbs.	Tons.	lbs.	Bush.	lbs.
Shamrock Purple Top....	June 4.	June 18.	Oct. 14.	Oct. 18.	37	480	1,241	20	33	120	1,102	00
Halewood's Bronze Top..	" 4.	" 18.	" 14.	" 18.	36	200	1,203	20	25	1,820	863	40
Hartley's Bronze........	" 4.	" 18.	" 14.	" 18.	32	600	1,076	40	28	1,760	962	40
Perfection Swede........	" 4.	" 18.	" 14.	" 18.	31	1,080	1,051	20	31	1,840	1,064	00
Skirving's...............	" 4.	" 18.	" 14.	" 18.	31	320	1,038	40	20	1,180	686	20
East Lothian............	" 4.	" 18.	" 14.	" 18.	30	800	1,013	20	24	360	806	00
Selected Purple Top.....	" 4.	" 18.	" 14.	" 18.	29	520	975	20	25	1,060	851	00
Bangholm Selected......	" 4.	" 18.	" 14.	" 18.	28	1,760	962	40	24	780	813	00
Selected Champion......	" 4.	" 18.	" 14.	" 18.	28	240	937	20	24	1,540	825	40
Carter's Elephant.... ...	" 4.	" 18.	" 14.	" 18.	27	1,380	923	00	19	1,520	658	40
Marquis of Lorne........	" 4.	" 18.	" 14.	" 18.	26	1,960	899	20	24	360	806	00
Prize Purple Top........	" 4.	" 18.	" 14.	" 18.	26	1,960	899	20	22	840	747	20
Mammoth Clyde.... ...	" 4.	" 18.	" 14.	" 18.	25	1,820	863	40	24	780	813	00
Sutton's Champion	" 4.	" 18.	" 14.	" 18.	25	1,820	863	40	24	1,540	825	40
Hall's Westbury....	" 4.	" 18.	" 14.	" 18.	25	1,060	851	00	26	1,960	899	20
Prize Winner..	" 4.	" 18.	" 14.	" 18.	25	1,060	851	00	23	1,880	798	00
Jumbo or Monarch......	" 4.	" 18.	" 14.	" 18.	24	360	806	00	19	760	646	00
Giant King....... ...	" 4.	" 18.	" 14.	" 18.	24	640	810	40	21	560	709	20

EXPERIMENTS WITH MANGELS.

Sixteen varieties of mangels were sown in this test. The soil and its preparation was similar to that of the turnip plots. Two sowings were made of each variety. Results as follows were obtained :—

MANGELS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per acre. 1st Plot.		Yield per acre. 1st Plot.		Yield per acre. 2nd Plot.		Yield per acre. 2nd Plot.	
					Ton.	lbs.	Bush.	lb.	Ton.	lbs.	Bush.	lbs.
Giant Yellow Intermediate....	June 4.	June 18.	Oct. 14.	Oct. 15.	34	400	1,140	..	23	1,880	798	..
Norbitan Giant.	" 4.	" 18.	" 14.	" 15.	34	400	1,140	.	23	340	772	40
Giant Yellow Half Long.	" 4.	" 18.	" 14.	" 15.	33	840	1,114	..	25	300	838	20
Ward's Large Oval Shaped.....	" 4.	" 18.	" 14.	" 15.	30	....	1,000	..	19	1,520	658	40
Yellow Intermediate........ .	" 4.	" 18.	" 14.	" 15.	29	1,280	988	..	21	1,320	722	..
Giant Yellow Globe..........	" 4.	" 18.	" 14.	" 15	29	1,280	988	..	23	340	772	20
Canadian Giant......	" 4.	" 18	" 14.	" 15.	28	1,000	950	..	20	1,040	684	..
Mammoth Long Red (Evans)..	" 4.	" 18.	" 14.	" 15.	27	1,480	924	40	23	1,100	785	..
Prize Mammoth Long Red.....	" 4.	" 18.	" 14.	" 15.	27	720	912	.	21	1,320	722	..
Champion Yellow Globe.	" 4.	" 18.	" 14.	" 15.	26	1,200	886	40	23	1,100	785	..
Gate Post...............	" 4.	" 18.	" 14.	" 15.	26	1,200	886	40	17	960	582	40
Golden Fleshed Tankard.......	" 4.	" 18.	" 14.	" 15.	26	1,200	886	40	18	1,220	620	40
Golden Tankard.......... .. .	" 4.	" 18.	" 14.	" 15.	25	1,060	851	..	19	1,520	658	40
Red Fleshed Tankard..........	" 4.	" 18.	" 14.	" 15.	25	300	838	20	14	880	481	20
Warden Orange Globe.........	" 4.	" 18.	" 14.	" 15.	24	1,540	825	40	23	340	772	20
Red Fleshed Globe............	" 4.	" 18.	" 14.	" 15.	21	560	709	20	22	80	731	40

EXPERIMENTS WITH CARROTS.

Fifteen varieties of carrots were experimented with. These plots were on soil similar in character and preparation to that used for the mangel and turnip plots. Two sowings were made of each variety, and the following results were obtained :—

CARROTS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per acre. 1st Plot.		Yield per acre. 1st Plot.		Yield per acre. 2nd Plot.		Yield per acre. 2nd Plot.	
					Ton.	lbs.	Bush.	lb.	Ton.	lbs.	Bush.	lb.
Iverson's Champion	June 4.	June 18.	Oct. 14.	Oct. 15.	21	1,320	722	00	13	580	443	00
Giant White Vosges	" 4.	" 18.	" 14.	" 15.	21	560	709	20	16	680	544	40
Green Top White Orthe	" 4.	" 18.	" 14.	" 15.	18	1,220	620	40	12	320	405	20
Half-long Chantenay .. , ...	" 4.	" 18.	" 14.	" 15.	17	960	582	40	12	320	405	20
Improved Short White	" 4.	" 18.	" 14.	" 15.	17	960	582	40	16	680	544	40
Yellow Intermediate............	" 4.	" 18.	" 14.	" 15.	16	1,440	557	20	8	1,280	288	00
Guerande or Ox Heart	" 4.	" 18.	" 14.	" 15.	16	1,440	557	20	11	40	367	20
Mammoth White Intermediate...	" 4.	" 18.	" 14.	" 15.	16	1,440	557	20	14	100	468	20
Half-long White.........	" 4.	" 18.	" 14.	" 15.	16	680	544	40	12	1,840	430	40
White Belgian	" 4.	" 18.	" 14.	" 15	13	1,360	456	00	10	1,280	354	40
Early Gem	" 4.	" 18.	" 14.	" 15.	13	1,360	456	00	14	100	468	20
Scarlet Intermediate............	" 4.	" 18.	" 14.	" 15.	11	800	380	00	7	1,000	250	00
Carter's Orange Giant...... ...	" 4.	" 18.	" 14.	" 15.	9	1,000	316	40	7	1,760	262	40
Long Scarlet Altringham	" 4.	" 18.	" 14.	" 15.	9	1,000	316	40	8	520	275	20
Long Orange or Surrey	" 4.	" 18.	" 14.	" 15.	9	240	304	00	7	1,760	262	40

EXPERIMENTS WITH SUGAR BEETS.

Six varieties of sugar beets were sown. These were on soil of similar character and prepared in the same manner as that used for the turnip, mangel and carrot plots. Two sowings were made of each variety. The following results were obtained :—

SUGAR-BEETS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per acre. 1st Plot.		Yield per acre. 1st Plot.		Yield per acre. 2nd Plot.		Yield per acre. 2nd Plot.	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
French White Red Top	June 4.	June 18.	Oct. 14.	Oct. 15.	23	1,880	798	00	19	760	646	00
Danish Improved	" 4.	" 18.	" 14.	" 15.	22	1,600	760	00	15	1,920	532	00
Red Top Sugar	" 4.	" 18.	" 14.	" 15.	22	1,600	760	00	16	1,440	557	20
Wanzleben	" 4.	" 18.	" 14.	" 15.	22	840	747	20	14	1,640	494	00
Improved Imperial	" 4.	" 18.	" 14	" 15.	20	1,040	684	00	15	400	506	40
Vilmorin's Improved	" 4.	" 18.	" 14.	" 15.	15	1,160	519	20	14	120	468	40

EXPERIMENTS WITH POTATOES.

One hundred and two varieties of potatoes were planted on the 25th of May. They were on a loamy soil, the previous crop was sunflowers. The land was manured in the fall of 1896 with thirty 20-bushel cart loads of barn-yard manure per acre, which was ploughed in. The land was again ploughed this spring and 200 pounds of bone meal was sown broadcast per acre and harrowed in. The plots consisted of two rows each 66 feet long and 26 inches apart.

All the plots were treated during the season with the Bordeaux mixture and very few rotten potatoes were found. The following results were obtained :—

POTATOES—Test of Varieties.

Name of Variety.	Dug.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.	
		Bus.	lbs.	Bus.	lbs.	Bus.	lbs.
Early Puritan	Oct. 1...	460	..	450	..	10	..
Clarke's No. 1	" 1...	412	30	385	..	27	30
Lee's Favourite	" 9...	412	30	385	..	27	30
Holborn Abundance	" 12...	412	30	387	30	25	..
I. X. L.	" 9...	400	..	377	30	22	30
Seedling No. 7	" 11...	400	..	372	30	27	30
Pearce's Prize Winner	" 11...	400	..	337	30	62	30
Seedling No. 230	" 1...	390	..	325	..	65	..
Early Rose	" 9...	380	..	250	..	130	..
Freeman	" 9...	377	30	315	..	62	30
Seattle	" 12...	377	30	317	30	60	..
Burpee's Extra Early	" 11...	370	..	310	..	60	..
Troy Seedling	" 11...	362	30	330	..	32	30
Dakota Red	" 9...	360	..	307	30	52	30
Carman No. 3	" 1...	360	..	287	30	72	30
Peerless Junior	" 1...	352	..	325	..	27	30
Ideal	" 1...	350	..	300	..	50	..
State of Maine	" 1...	347	30	277	30	70	..
Good News	" 11...	345	..	275	..	70	..
General Gordon	" 9...	345	..	260	..	85	..
McKenzie	" 1...	345	..	320	..	25	..
Maule's Thoroughbred	" 11...	337	30	272	30	65	..

POTATOES—Test of Varieties.—*Continued.*

Name of Variety.	Dug.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.	
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Carman No. 1	Oct. 9	335	..	305	..	30	..
Rural No. 2.	" 11	335	..	297	30	37	30
Quaker City	" 11	327	30	270	..	57	30
Early Ohio	" 1	325	..	290	..	35	..
Lizzie's Pride	" 1	325	..	300	..	25	..
Record	" 1	325	..	235	..	90	..
Burnaby Seedling	" 9	322	30	265	..	57	30
Everett	" 11	320	..	282	30	37	30
Lightning Express	" 11	320	..	300	..	20	..
Great Divide	" 9	320	..	297	30	22	30
Irish Cobbler	" 11	317	30	252	30	65	..
Queen of the Valley	" 9	317	30	255	..	62	30
Rochester Rose	" 1	312	30	290	..	22	30
Green Mountain	" 9	315	..	237	30	77	30
Maggie Murphy	" 9	315	..	225	..	90	..
Reeve's Rose	" 9	315	..	250	..	65	..
Brownell's Winner	" 1	312	30	287	30	25	..
Early Gem	" 1	310	..	277	30	32	30
Early Harvest	" 1	307	30	207	30	100	..
Russell's Seedling	" 9	307	30	145	..	162	30
Money Maker	" 11	305	..	267	30	37	30
Fill-Basket	" 11	300	..	200	..	100	..
Northern Spy	" 1	300	..	270	..	30	..
Henderson's Late Puritan	" 9	295	..	242	30	52	30
Hopeful	" 1	295	..	252	30	42	30
Sharpe's Seedling	" 1	295	..	227	30	67	30
Bill Nye	" 9	295	..	270	..	25	..
Brown's Rot Proof	" 11	295	..	212	30	82	30
Wonder of the World	" 11	295	..	270	..	25	..
Hale's Champion	" 9	292	30	250	..	42	30
Columbus	" 11	292	30	255	..	37	30
Charles Downing	" 11	290	..	175	..	115	..
Dreer's Standard	" 1	290	..	207	30	82	30
Reading Giant	" 1	287	30	187	30	100	..
Vick's Extra Early	" 1	287	30	192	30	95	..
Early Six Weeks	" 1	285	..	232	30	52	30
Munro County	" 9	285	..	257	30	27	30
Kidney	" 11	280	..	262	30	17	30
Early Sunrise	" 1	280	..	250	..	30	..
Irish Beauty	" 9	277	30	180	..	97	30
American Wonder	" 11	275	..	225	..	50	..
Pride of the Table	" 11	275	..	250	..	25	..
Daisy	" 11	275	..	250	..	25	..
New Variety No. 1	" 11	275	..	262	30	12	30
Algoma No. 1	" 1	275	..	250	..	25	..
Crown Jewel	" 9	272	30	250	..	22	30
Rural Blush	" 9	272	30	202	30	70	..
World's Fair	" 9	270	..	237	30	32	30
Harbinger	" 1	267	30	167	30	100	..
London	" 11	265	..	187	30	77	30
Thorburn	" 11	265	..	197	30	67	30
New Queen	" 9	265	..	250	..	15	..
Pride of the Market	" 9	262	30	250	..	12	30
Orphans	" 9	257	30	217	30	40	..
Vanier	" 11	255	..	205	..	50	..
Empire State	" 1	252	30	225	..	27	30
Early White Prize	" 1	252	30	200	..	52	30
Victor Rose	" 9	250	..	205	..	45	..
Uncle Sam	" 9	250	..	220	..	30	..
Honeoye Rose	" 11	250	..	187	30	62	30
Delaware	" 11	245	..	185	..	60	..
Chicago Market	" 11	245	..	220	..	25	..
King of the Roses	" 11	240	..	145	..	95	..
Earliest of All	" 1	240	..	187	30	52	30
Stourbridge Glory	" 9	235	..	170	..	65	..
Satisfaction	" 1	225	..	175	..	50	..
Beauty of Hebron	" 1	222	30	182	30	40	..
Houlton Rose	" 11	220	..	175	..	45	..
Early Norther	" 9	217	30	162	30	55	..
Bruce's White Beauty	" 11	215	..	150	..	65	..

POTATOES—Test of Varieties—*Concluded.*

Name of Variety.	Dug.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.	
		Bush.	lbs.	Bus.	lbs.	Bus.	lbs.
Table King	Oct. 11	215	..	167	30	47	30
Seedling No. 214	" 9	200	..	87	30	112	30
Prize Taker	" 11	195	..	125	..	70	.
Clay Rose	" 9	192	30	140	..	52	30
Polaris	" 11	182	30	157	30	25	..
Flemish Beauty Seedling	" 11	177	30	140	..	37	30
Ohio Junior	" 9	175	..	137	30	37	30
Pearce's Extra Early	" 1	170	..	100	..	70	..
Sir Walter Raleigh	" 11	165	..	150	..	15	..

EXPERIMENTS WITH INDIAN CORN.

Twenty-five varieties of Indian Corn for ensilage were sown on 4th June. The land used for this experiment was a sandy loam, the previous crop was wheat, barley, and oats; it being the land used for the early, medium and late sown plots of grain last year. This was ploughed in the spring.—It was fertilized with 5 barrels of hardwood ashes and 200 pounds of bone meal per acre, which was sown broadcast and harrowed in.

Owing to the limited amount of barn-yard manure there was none of this available for the corn land, with result that a smaller yield than usual was obtained.

One set of plots were sown in rows 3 feet apart, and a duplicate set were planted alongside in hills 3 feet apart each way. The following table gives the results obtained:—

INDIAN CORN—Test of Varieties.

Name of Variety.	Character of Growth.	Height.	When Tasselled.	In Silk.	Early Milk.	Late Milk	Condition when Cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
		In.						Tons.	Lbs.	Tons.	Lbs.
Comptons Early	Very strong.	84	Aug. 20	Aug. 30	Sept. 16	Sept. 30	2nd milk	11	1,100	10	460
Longfellow	Strong	83	" 20	" 31	" 14	" 30	"	11	000	11	550
Sanford	"	60	" 20	Sept. 1	" 15	" 30	"	11	000	11	440
Early Butler	"	60	" 31	" 10	" 20	Oct. 1	"	10	1,670	6	1,970
Angel of Midnight	Very strong.	84	" 18	Aug. 31	" 16	Sept. 30	"	10	1,450	10	240
Cloud's Early Yellow	Strong	64	Sept. 10	Sept. 16	" 25	....	"	10	1,340	9	1,470
New White Cap, Yellow Dent	"	80	Aug. 30	" 16	" 20	....	1st "	10	130	9	150
King of the Earliest	Medium	70	" 25	Aug. 31	" 14	Sept. 22	2nd "	9	370	9	700
Mamm. 8-Rowed Flint.	"	60	" 20	Sept. 6	" 20	....	1st "	8	1,270	13	400
North Dakota, White	Weak	65	" 20	" 8	" 20	....	"	8	850	7	1,400
Mitchell's Extra Early	"	50	" 15	Aug. 28	" 6	Sept. 15	Glazed .	8	170	4	800
Red Cob Ensilage	Medium	40	Sept. 16	....	....	....	Tassel'g.	7	1,400	13	500
Champion White Pearl	"	60	" 16	....	....	....	"	7	630	11	000
Extra Early Huron Dent	"	60	Aug. 31	Sept. 10	Sept. 20	Oct. 1	2nd milk	7	300	6	870
Pearce's Prolific	Weak	84	" 18	Aug. 31	" 15	Sept. 28	"	7	300	6	870
Selected Leaming	Medium	60	Sept. 16	Sept. 22	" 28	....	1st "	6	1,200	13	400
Thoroughbred White Flint	"	60	Aug. 28	" 15	" 28	....	"	5	1,550	6	870
Pride of the North	Weak	65	" 27	" 10	" 20	Sept. 28	2nd "	5	1,550	6	870
Canada White Flint	Medium	60	" 24	" 8	" 21	" 28	"	5	1,000	9	1,800
Cuban Giant	"	60	Sept. 16	" 30	....	....	Silk	5	1,000	8	1,270
Kendall's Giant	Weak	40	Aug. 20	" 5	Sept. 20	Oct. 1	2nd milk	4	1,900	6	1,200
Giant Prolific, Ensilage	"	45	Sept. 16	" 28	....	....	Silk	4	1,200	4	250
North Dakota, Yellow	"	50	Aug. 25	" 1	Sept. 20	Oct. 3	2nd milk	4	800	5	1,000
Mammoth Sweet Fodder.	"	40	" 25	" 5	" 20	" 2	"	4	800	4	250
Ninety Day	Very weak.	35	Sept. 6	" 25	Oct. 5	....	1st "	2	1170	5	340

GENERAL STATEMENT OF FODDER CROPS.

In addition to the turnip plots which yielded 299 bushels ; 3 acres of turnips yielded 800 bushels per acre, and one-third acre plot produced 360 bushels, making a total of 3,059 bushels.

The mangel plots yielded 227 bushels, and $\frac{2}{3}$ of an acre yielded 360 bushels, making a total of 587 bushels of mangels. To this may be added the yield from the carrot plots, 108 bushels and also that from the plots of sugar beets, 71 bushels. This makes 3,825 bushels as the total amount of roots harvested.

One and one-quarter acre of horse beans produced 11 tons 250 pounds, equal to 9 tons per acre ; $\frac{1}{2}$ acre of sunflowers, 2 tons 712 pounds ; $2\frac{1}{2}$ acres of corn yielded 7 tons per acre, and $\frac{1}{8}$ acre 1 ton 1,250 pounds, equal to 13 tons per acre. This together with the product of corn plots of 10 tons 360 pounds, makes a total of 42 tons 1,572 pounds, all of which was put into the silo.

PREPARATION OF THE LAND FOR THE FIELD TURNIPS.

The field turnips were grown on land the previous crop of which was oats. The land was ploughed in the fall. In the spring it was again ploughed, worked up and drilled into rows 28 inches apart. Into these drills barn yard manure at the rate of thirty 20-bushel cart loads per acre was put, and a fertilizer at the rate of 300 pounds per acre, made of 150 pounds of complete fertilizer, and 150 pounds of bone meal mixed together, which was sown along on top of the manure, and the whole covered.

PREPARATION OF LAND FOR THE FIELD CORN.

The land on which the field corn was planted was in timothy and clover hay the two previous seasons. This was ploughed in the spring and fertilizer at the rate of 250 pounds per acre used. This fertilizer consisted of 125 pounds of bone meal and 125 pounds of complete fertilizer mixed together. The corn was sown with the grain drill, in rows 3 feet apart. The fertilizer was applied at the same time by allowing all the pipes of the fertilizer attachment of the seed drill to run ; thus the fertilizer was sown over the whole ground, being drilled in, as when sowing grain, in rows 6 inches apart.

One strip of this land of $\frac{1}{8}$ acre was manured on the sod, the previous fall at the rate of thirty 20-bushel cartloads of barn-yard manure per acre. On the land so treated the yield of corn per acre was 13 tons, and that which received no barn-yard manure bnt treated similar in every other respect, yielded only 7 tons per acre.

PREPARATION OF THE LAND FOR THE HORSE BEANS AND SUNFLOWERS.

The land on which the English horse beans were sown was in timothy and clover the two previous years. Barn-yard manure at the rate of forty 20-bushel cart loads per acre, was ploughed under in the fall of 1896. This was worked up in the spring, and the beans sown in rows 3 feet apart.

The sunflowers were also sown, in rows 3 feet apart, on land adjoining that used for the beans, which received similar treatment.

MILLET.

Four varieties of millet were sown 12th June in one-fortieth acre plots. The land was in timothy and clover the previous year. It was ploughed in the fall of 1896. The millet made a good strong growth and was cut for feed 30th August. The stock did not eat it readily. I do not consider it as valuable as oats, pease and vetches for feeding stock.

The weight of green fodder per acre as calculated from these plots was as follows :—

	Tons.	Lbs.
Japan	22	1,980
New Manitoba	12	200
Golden Millet	9	1,360
New Siberian	8	940

GRAIN CROPS WITH AND WITHOUT CLOVER.

In order to further test the value of sowing Mammoth Red Clover with grain crops, for the purpose of ploughing under a similar experiment to the one conducted last year was carried out this season. The plots used for this purpose last year were again utilized. The whole set of plots were, however, sown with oats. Clover at the rate of ten pounds per acre was sown on the plots which had clover on them last year; the check plots were left as before without seeding to clover. Fertilizer at the rate of 250 pounds per acre was used. It was made of 125 pounds of bone meal and 125 pounds of complete fertilizer mixd together.

No difference was noticed in the growth of grain on the plots which were seeded to clover last year and those which were not. This was, no doubt, due to the very poor growth made by the clover on these plots last season. The clover this season has made a strong growth and an after-math of from 6 to eight inches has been ploughed under.

RATION FED MILCH COWS.

During the winter months the cows were fed the following ration night and morning, with a feed of long hay at noon :—

	Lbs.
Hay	4
Straw	2
Roots (Turnips and Mangels)	15
Meal	$2\frac{1}{2}$

The straw and hay being cut and the roots pulped, the whole was mixed together and sprinkled with water till quite damp. For the month of May 30 pounds of ensilage per day was substituted for 30 pounds of roots, with this change there was no noticeable difference in the flow of milk. The ration of meal was continued when the cows were turned out to grass in the spring. The following table gives the total yield of milk from the cows for the season :—

MILK produced from Seven Cows during the past year.

Name.	Date of Calving.	When due to Calve again.	Condition Nov. 1st.	No. of Days Milking.	Total Pounds of Milk for the Period.	Average Yield per Day.
Piggott	Jan. 6, 1897.	Jan. 30, 1898.	10 lbs. per day	286	6,913	24
Eva Rooker	Nov. 1, 1896.	Oct. 11, 1897.	Milking	288	4,176	$14\frac{1}{2}$
Smith	Sept. 28, 1896.	April 16, 1898.	15 lbs. per day	397	7,213	18
Tingley	Dec. 6, 1896.	Nov. 15, 1897.	Dry	289	7,225	25
Jennie	Feb. 6, 1897.	Mar. 19, 1898.	19 lbs. per day	233	6,281	27
Reid	May 5, 1897.	Not in calf	24 "	148	5,152	$34\frac{3}{4}$
Brindle	Oct. 31, 1896.	Dec. 17, 1897.	Dry	306	5,118	$13\frac{1}{2}$

STOCK SOLD.

On the 4th of November I received instructions to sell a part of the farm stock. The animals disposed of included 12 cows and 2 bulls, as follows:—

4 Holstein cows, 1 Ayrshire cow, 2 Durham cows, 1 Grade cow, 1 Holstein bull, 1 Ayrshire bull.

As a result of the sale of this stock in November, and no purchases to replace them a large quantity of bran and ensilage were left over. As many roots as could be fed to the remaining animals were used, and all that could be sold in the neighbourhood were so disposed of, but a portion was unavoidably spoilt.

MANURE AND FERTILIZERS USED.

Owing to the limited amount of stock kept last winter only 150 tons of barn-yard manure was made, this together with $275 worth of fertilizers; including 100 barrels of soft wood ashes, bone meal and complete fertilizers, was not sufficient to manure much more than the extensive area devoted to plot work; consequently the large field crops did not receive the manure they should, with the result that small crops were harvested.

DRAINING.

On the marsh 1,000 feet of wooden 14 x 20 inch sluice drain was laid, and 1,000 feet of open ditch $2\frac{1}{2}$ feet wide by 2 feet deep. On the upland 1,500 feet of 2 inch tile drain was laid.

DISTRIBUTION OF SEED GRAIN AND POTATOES.

In all 543 applicants have been supplied during the past year with 3 pound samples of potatoes, oats, wheat, barley, pease and rye.

The number of packages sent out was as follows:—

Potatoes	302
Oats	345
Barley	183
Wheat	91
Pease	83
Rye	6
Total	1,010

MEETINGS ATTENDED.

I have addressed meetings during the past year at Fredericton, N.B., Annapolis, N.S.; Musquodoboit, N.S.; and in Prince Edward Island.

EXHIBITIONS ATTENDED.

An exhibit of the farm produce was made at Charlottetown, P.E.I., from September 21st to the 24; at Halifax, N.S., 27th September to 5th October, and at the Westmoreland County Exhibition, Sackville, N.B., 14th October.

I have the honour to be,

Your obedient servant,

GEO. W. FORREST,

Superintendent.

REPORT OF THE HORTICULTURIST.

(W. S. BLAIR.)

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith a report of some of the work done in the Horticultural Division of the Experimental Farm for the maritime provinces for the year 1897.

The apple crop during the past year has been small; the pear, plum and cherry crops were a failure. The strawberries yielded well, and the new plantation of 36 varieties has made good growth. The raspberries were a fair crop. The raspberry canes as well as those of the blackberries were badly diseased with the raspberry anthracnose *Glœosporium venetum*; as a result the present growth is only fair. New varieties of small fruits have been planted, many of which are making strong growth.

The balance of orchard No. 2 was this year planted with trees; some of which were taken from the nursery here, where they had been set in the spring of 1895, when received from the Central Experimental Farm; the remainder were from the Ellwanger and Barry, nurseries, Rochester, N.Y. The former have not made very promising growth; the latter were very thrifty looking trees which arrived in good condition, and have made good growth.

The shrubs, trees and hedges have made fair growth and each year are becoming more of a source of interest. The new varieties received from the Central Experimental Farm in the spring will, no doubt, be a valuable addition.

The flower garden was continued as usual. The bulbs planted in the fall of 1896 were much admired in the early spring. Many new varieties of tulips, hyacinths, narcissus and lillies were this fall added to this interesting collection. A collection of 28 varieties of Japanese Paeonies, and 48 varieties of Japanese Irises were received this autumn and planted.

Experiments were again carried on with different varieties of vegetables, and a summary, of the relative value of those tested, is given in this report.

Data on the blossoming period of the different varieties of fruit trees grown on the farm were again furnished the horticulturist of the Central Experimental Farm.

Few particulars of immediate value were gathered from the experimental grass plots. The plots of crimson clover sown on the 18th of August and 1st September, did not stand the winter. The plot of Tussock grass reported upon last year has turned out to be *Bromus inermis*. The land on which this was sown was previously in Brome grass and quite probably was not well enough worked up; at any rate the growth made proved to be largely made up of the grass named.

APPLE ORCHARD, No. 1.

In this orchard there are now growing 176 trees of 82 varieties. In the annual report for 1895, particulars relating to the planting and growth of the trees from this orchard were given from the time of the first planting in 1889, to, and including, 1894. Since then there has been lost from various causes 29 trees of the following varieties: 2 Baldwin, 1 Baxter, 2 Coopers Market, 1 Early Prolific, 1 Fallawater, 1 Gipsy Girl, 2 Grimes's Golden, 1 Nonpareil, 2 Newtown Pippin, 1 Pryor's Red, 2 Ribston Pippin, 1 Roxbury Russet, 1 Spitzenburg, 2 St. Lawrence, 1 Scott's Winter, 1 Talman's Sweet, 1 Twenty-ounce Pippin, 1 Wagener, 2 White Pippin, 2 Wealthy, 1 Walbridge. Part of these have been winter-killed while some others have died from the effects of a disease

in the bark and a few from being received in bad order, having been heated in the package during transportation.

Some of the trees now growing present a stunted and unthrifty appearance, and I find in most cases such trees have unhealthy heart-wood.

The following tabular arrangement gives the names of the varieties planted and their present condition:

APPLE ORCHARD No. 1.

Name of Variety.	When Planted.	Number of Trees.	Fruited.	Character of Growth.
Anisovka	1889	1	Yes	Strong.
Aport	1889	2	"	"
Ananasnoe	1889	2	"	"
Anis	1890	2	"	1 fair, 1 strong.
Alexander	1890	3	"	Strong.
Autumn Strawberry	1895	2	No	1 fair, 1 weak.
Benoni	1890	2	Yes	1 strong, 1 fair.
Blue Pearmain	1890	1	"	Strong.
Blackwood	1889	2	"	"
Bank's	1895	1	No	1 weak.
Borovinka	1889	1	Yes	Strong.
Bellflower	1889	1	"	"
"	1892	2	No	"
Bottle Greening	1891	1	"	"
Blushed Calville	1895	1	"	"
Buckingham	1895	2	"	1 strong, 1 fair.
Belle de Boskoop	1897	1	"	Weak.
Ben Davis	1893	2	Yes	Strong.
Canada Baldwin	1890	3	"	"
Canada Red	1890	2	"	1 fair, 1 weak.
Chenango Strawberry	1892	2	"	Fair.
Crimean Bogdanoff	1895	1	No	Strong
Carolina Red June	1895	2	"	Fair.
Colvert	1890	2	Yes	"
Duchess	1890	3	"	2 strong, 1 fair.
"	1892	4	"	1 " 3 "
Dominie	1895	2	No	Strong.
Fameuse	1890	4	Yes	Fair.
Flory Belle	1897	1	No	Weak.
Fallawater	1895	1	"	1 weak.
Gravenstein	1889	1	"	Fair.
"	1895	2	"	1 strong, 1 fair.
Golden Reinette	1895	1	"	Strong.
Golden Russet	1890	3	Yes	"
"	1892	1	"	"
Grimes' Golden	1890	3	"	1 strong, 2 fair.
Golden White	1895	2	No	Fair.
Haas	1890	3	Yes	Strong.
Hibernal	1894	1	No	"
"	1895	1	"	"
Hyde's King	1897	1	"	Weak.
Jonathan	1890	3	Yes	2 fair, 1 strong.
Keswick Codlin	1890	3	"	Fair.
King	1893	3	No	1 fair, 2 strong.
Kara Synap	1895	2	"	Weak.
Longfield	1890	3	Yes	Strong.
Mann	1890	3	No	Fair.
Maidens Blush	1890	3	Yes	1 strong, 2 fair.
Milding	1893	1	No	Strong.
McIntosh Red	1890	3	Yes	Fair.
McMahan White	1895	1	No	Strong.
Northern Spy	1890	3	"	1 strong, 1 fair, 1 weak.
Ostrakoff	1889	3	Yes	Strong.
Ontario	1890	2	"	1 fair, 1 weak.
Peach	1893	3	"	Weak.
"	1894	1	No	Strong.
"	1895	1	"	"
Pewaukee	1890	3	Yes	"
"	1892	2	"	"

APPLE ORCHARD No. 2—*Concluded.*

Name of Variety.	When Planted.	Number of Trees.	Fruited.	Character of Growth.
Princess Louise	1892	2	Yes	Fair.
Pewaukee Russet	1895	1	No	Strong.
Peck's Pleasant	1895	1	"	"
Peter	1893	1	"	Weak.
Rambo	1890	2	Yes	Fair.
Ribston Pippin	1894	2	"	"
R. I. Greening	1890	3	"	"
Rome Beauty	1895	2	"	Strong.
Red Astrachan	1890	5	Yes	3 strong, 2 fair.
Royal Table	1895	2	No	1 " 1 "
Red Bietigheimer	1893	2	"	1 " 1 "
Roxbury Russet	1893	1	"	1 "
Stark	1894	1	"	Fair.
Serinkia	1889	2	"	"
Spitzenburg	1894	1	"	1 strong.
Sultan	1890	2	Yes	1 strong, 1 fair.
Seek-No-Further	1895	2	No	Strong.
St. Lawrence	1890	3	"	1 strong, 2 fair.
Sop of Wine	1897	1	"	Weak.
Scott's Winter	1890	2	Yes	2 strong.
Shannon	1897	1	No	Fair.
Tetofsky	1889	1	Yes	"
Titovka	1889	2	"	Strong.
Trenton	1893	1	"	"
Talman's Sweet	1890	2	"	2 strong.
Twenty-ounce Pippin	1893	1	No	Weak.
Wellington	1893	2	Yes	1 strong, 1 fair.
Wagener	1890	1	"	Fair.
Wealthy	1890	1	"	"
"	1897	2	No	"
Walbridge	1893	1	"	Strong.
Yellow Transparent	1890	5	Yes	2 strong, 3 fair.

APPLE ORCHARD No. 2.

This orchard is situated on a somewhat higher piece of land than orchard No. 1, and is protected on all sides by a windbreak of a natural growth of spruce.

The land was cut and cleared in 1890 and some 39 apple trees were planted amongst the stumps at that time. Some of the trees then planted have made good growth, with others the growth has not been so satisfactory. The land has since been broken up and was this year all planted with apple trees. Part of this land was underdrained in the fall of 1896; the other part was drained this autumn. The very wet season was very unfavourable for the trees planted in the undrained land and they have made weak growth, and some few have died. The trees planted on the underdrained part have all made strong growth.

Between the growth of the trees in this orchard, and those in orchard No. 1, there is a decided difference in favour of the latter.

Two trees planted have died from the effects of "sun scald;" 12 were so badly girdled by mice in the winter of 1894–95, that they had to be replaced.

This orchard now contains 160 living trees of 90 varieties—67 of which are not represented in orchard No. 1. This gives us in the two orchards a total of 336 apple trees including 149 varieties.

The following table gives the present condition of the orchard :—

APPLE ORCHARD No. 2.

Name of Variety.	Planted.	Number of trees planted.	Number of trees living.	Fruited.	Character of Growth.
Arabskoe	1897	2	2	No	Strong.
Antonovka	1897	2	2	"	Weak.
Atkison	1897	2	2	"	"
Arabka, Winter	1897	2	2	"	"
Avenarius No. 15	1897	2	2	"	"
Blue Pearmain	1890	2	1	Yes	1 strong ; 1 dead, 1895.
Bell Pippin	1897	3	3	No	2 fair, 1 strong.
Blushed Calville	1897	1	1	"	Fair.
Blenheim Pippin	1897	2	2	"	1 fair, 1 weak.
Brownlee's Russet	1897	2	2	"	Weak.
Ben Davis	1897	2	2	"	Strong.
Belle de Boskoop	1897	1	1	"	Fair.
Babbit	1897	2	2	"	Weak.
Basil The Great	1897	2	2	"	"
Beautiful Arcad	1897	2	2	"	"
Cinnamon Pine	1895	1	1	"	Strong.
" "	1897	1	1	"	Weak.
Charlotten Thaler	1897	1	1	"	"
Canada Reinette	1897	2	2	"	1 fair, 1 weak.
Cox's Pomona	1897	2	2	"	Strong.
Cross 15.M	1897	2	2	"	Weak.
Derby	1890	3	2	Yes	2 strong, 1 dead, 1894.
Duchess	1893	2	2	"	Strong.
Danver's Winter Sweet	1897	2	2	No	Weak.
Early Strawberry	1897	2	2	"	Strong.
Early Colton	1897	2	2	"	Weak.
Enormous	1897	1	1	"	"
Fameuse	1893	2	2	"	Strong.
Fanny	1897	2	2	"	"
Grimes' Golden	1891	2	1	Yes	1 strong, 1 dead, 1895.
Golden Russet	1892	2	2	"	Strong.
Gravenstein	1893	3	1	No	1 strong, 1 dead, 1895.
Grandmother	1897	2	2	"	Weak.
Golden Reinette	1897	1	1	"	"
Gano	1897	2	2	"	Fair.
Golden Sweet	1897	1	1	"	"
Hastings	1892	2	1	"	1 strong, 1 dead, 1893.
Hurlbut	1897	2	2	"	Strong.
Hibernal (Fisk)	1897	2	1	"	1 weak, 1 dead, 1897.
Headley	1897	2	2	"	Weak.
Jeffries	1897	2	2	"	Strong.
John A.	1897	2	0	....	Dead, 1897.
King	1897	1	1	No	Strong.
Little Hat	1897	2	1	"	1 weak, 1 dead, 1897.
Lord Suffield	1897	2	2	"	Fair.
Long Arcad	1897	2	2	"	Weak.
Missouri Pippin	1897	2	2	"	Strong.
Mother	1897	2	2	"	1 strong, 1 weak.
Melonen	1897	1	1	"	Weak.
Munson's Sweet	1897	2	0	....	Dead, 1897.
Nothern Spy	1892	3	2	No	2 strong, 1 dead, 1895.
Newtown Pippin	1897	2	2	"	Strong.
Worth-western Greening	1897	2	2	"	Weak.
Newell's Winter	1897	2	2	"	"
Occident	1897	2	2	"	Strong.
Ontario	1897	1	1	"	"
Pointed Pipka	1896	4	4	"	"
Pewaukee	1891	2	2	"	"
Pryor's Red	1896	1	1	"	Weak.
Palmer Greening	1897	2	2	"	Strong.
Primate	1897	2	2	"	Fair.
Porter	1897	2	2	"	Strong.
Pomme Grise	1897	2	2	"	"
Pipka Winter Bogdanoff	1897	2	1	"	1 weak, 1 dead, 1897.

APPLE ORCHARD No. 2—*Concluded.*

Name of Variety.	Planted.	Number of trees planted.	Number of trees living.	Fruited.	Character of Growth.
Patten's Greening	1897	2	2	No.	Weak.
Peck's Pleasant	1897	1	0	......	Dead, 1897.
Russian Tyrol	1895	1	1	No	Strong.
Red Astrachan	1893	3	1	"	1 fair, 2 dead, 1895.
Red Russet	1897	2	2	"	1 fair, 1 weak.
Red Canada	1897	2	2	"	" "
Rome Beauty	1897	2	2	"	1 strong, 1 weak.
Renand Seedling	1897	2	2	"	Weak.
Ribston Pippin	1897	2	2	"	1 weak, 1 fair.
Silken Leaf	1897	2	2	"	Weak.
Smith's Cider	1897	2	2	"	Strong.
Sutton's Beauty	1897	2	2	"	"
Stump	1897	2	2	"	"
Summer Rose	1897	2	2	"	1 strong, 1 fair.
Swaar	1897	2	2	"	Weak.
Sunbeam	1897	1	1	"	"
Snelling Seedling	1897	2	0	....	Dead, 1897.
Shannon	1897	1	1	No	Weak.
Sops of Wine	1897	1	1	"	Fair.
Tuft's Baldwin	1897	2	2	"	Strong.
Uncle Sam	1897	2	1	"	1 weak, 1 dead, 1897.
Winter Bough	1890	3	3	Yes	Strong
White Astrachan	1891	3	2	"	Fair, 1 dead, 1892.
Wine Sap	1897	2	2	No.	Weak.
William's Favourite	1897	2	2	"	1 strong, 1 weak.
White Pigeon	1897	2	2	"	Weak.
Watterson	1897	2	2	"	1 weak, 1 fair.
Western Beauty	1897	2	2	"	Weak.
Windsor Chief	1897	2	2	"	"
Wagener	1891	1	0	....	Dead, 1895.
Yellow Transparent	1892	2	1	Yes	Strong, 1 dead, 1895.
York Imperal	1897	2	2	No.	Strong.

CRAB APPLES.

Most of the varieties of crab apples have made excellent growth. The variety Whitney, planted in 1890, made a strong growth for a few years, fruited well but has since been gradually dying out. Those planted in 1893 have made only fair growth.

This collection consists of 31 trees of ten varieties as shown in the following table.

Name of Variety.	Planted.	Number of trees planted.	Number of trees living.	Fruited.	Character of Growth.
General Grant	1892	2	2	Yes	Strong.
Hyslop	1890	3	3	"	"
"	1893	2	2	"	Fair.
Leslie's Sweet	1897	2	2	No	"
Montreal Beauty	1890	3	3	Yes	Strong.
"	1893	1	1	"	Fair.
"	1894	1	1	"	"
Martha	1893	2	2	"	Strong.
Soulard	1895	2	2	"	"
Siberian	1890	4	4	"	3 strong, 1 weak.
Transcendent	1890	3	3	"	Strong.
"	1893	2	2	"	"
Van Wycke	1895	1	1	No	"
Whitney	1890	3	1	Yes	1 weak, 2 dead, 1895.
"	1893	2	2	"	Fair.

PEARS.

Some of the pear trees have made very good growth. The varieties Seckel and Doyenne Boussock have been winter-killed.

Particulars regarding this orchard from 1892 to 1894 will also be found in the Annual Report for 1895. The collection of pears now consists of 68 trees including 30 varieties.

The following table shows the present state of the pear orchard :—

Name of Variety.	When planted.	No. of Trees.	Fruited.	Condition of Growth.
Bezi de la Motte	1897	2	No	1 fair, 1 strong.
Bessemianka Budd, 108	1897	2	"	Fair.
" Budd and Gibb	1897	1	"	Strong.
" Var. 102	1895	2	"	"
" Var. 102	1897	1	"	Fair.
Bartlett	1892	3	"	2 strong, 1 fair.
Beurré Hardy	1893	2	Yes	1 fair, 1 dead, 1897.
Beurré Superfin	1892	2	No	1 strong, 1 fair.
Beurré Clairgeau	1892	1	"	1 fair.
Beurré d'Anjou	1892	5	"	2 strong, 2 fair, 1 weak.
Clapp's Favourite	1892	3	"	1 strong, 2 weak.
" "	1893	1	"	1 "
Doyenne Boussock	1897	2	"	Weak.
Dempsey	1893	1	"	Strong.
Dr. Reeder	1892	1	"	"
"	1897	1	"	"
Duchess	1892	1	Yes	"
Flemish Beauty	1892	5	"	4 strong, 1 fair.
Frederick Clapp	1893	1	No	Fair.
Goodale	1893	1	"	1 dead, 1894.
Howell	1893	2	"	1 fair, 1 strong.
Helen	1897	2	"	2 dead, 1897.
Idaho	1895	2	"	Fair.
Justine	1897	2	"	Strong.
Josephine	1897	2	"	1 fair, 1 weak.
Keiffer	1895	2	"	Fair.
Longworth	1897	2	"	1 weak, 1 dead, 1897.
Lawson	1895	2	"	Strong.
Lawrence	1892	2	Yes	"
Louise Bonne	1897	2	No	1 weak, 1 dead, 1897.
Matilda	1897	2	"	1 strong, 1 weak.
Mount Vernon	1893	3	"	2 weak, 1 strong.
Margaret	1895	2	"	Dead, 1897.
Osband's Summer	1895	2	"	Strong.
Seckel	1895	2	"	Both dead, 1896.
Sheldon	1892	1	"	Strong.
"	1893	2	"	1 strong, 1 weak.
Tyson	1892	2	"	Strong.
"	1895	1	"	"
Vermont Beauty	1895	2	"	"
Wilder	1895	2	"	1 strong, 1 dead, 1896.

CHERRIES.

Last winter was so severe that the fruit buds of the cherry trees were killed. The variety Dyehouse, planted in 1892, was completely winter killed. This tree was a strong vigorous grower and had fruited well. Gov. Wood, also a very strong grower and excellent fruiter, was badly injured by winter. Two-thirds of the branches of this variety including all on the south side, were killed. Leib fruited very young but killed out last winter. Particulars of the history of this orchard from 1891 to 1894 inclusive. will be found in the annual report for 1894.

The cherry orchard now contains 68 trees including 36 varieties. The following table gives years when the trees were planted and the deaths which have occurred since 1894.

Name of Variety.	When Planted.	Number of Trees.	Fruited.	Condition of Growth.
Archduke	1897	2	No.	Strong.
Black Tartarian	1892	2	"	1 fair, 1 strong.
Black Eagle	1893	1	"	Fair.
Belle Magnifique	1895	2	"	1 strong, 1 fair.
Black Heart	1892	2	"	1 fair, 1 strong.
Centennial	1895	2	"	Both dead, 1895.
Coe's Transparent	1892	1	Yes	Weak.
Carnation	1897	2	No.	1 fair, 1 weak.
Dyehouse	1892	1	Yes	Dead, 1897.
" "	1895	2	No.	Strong.
English Morello	1892	3	Yes	2 strong, 1 fair.
" "	1893	2	"	Strong.
Early Richmond	1891	5	"	"
" "	1892	4	"	"
Elton	1893	1		1 dead, 1897.
Governor Wood	1892	3	Yes	Badly winter-killed.
Gruner Glass	1895	2	"	Strong.
Knight's Early Black	1893	2		Dead, 1896-7.
Leib	1893	2	Yes	" 1897.
Late Duke	1892	2	No.	1 fair, 1 dead, 1895.
"	1897	2	"	1 strong, 1 weak.
Lithauer	1895	2	"	1 fair, 1 dead, 1897.
Love Apple	1895	2	"	1 strong, 1 dead, 1897.
Louis Philippe	1892	1	Yes	Strong.
" "	1893	1		Dead, 1894.
May Duke	1895	2	No.	1 strong, 1 fair.
Montmorency	1892	2	Yes	Strong.
"	1893	2	"	"
Napoleon	1892	1	"	"
"	1893	1	No.	Fair.
Ostheim	1892	2	Yes	Strong.
Olivet	1892	2	"	1 fair, 1 strong.
Orel	1893	1	"	Strong.
"	1895	4	"	2 dead, 1896, 2 strong.
Ohio Beauty	1895	2	No.	Strong.
Plymouth Rock	1895	2	"	1 weak, 1 dead, 1895.
Rockport	1895	2	"	1 strong, 1 dead, 1897.
Royal Duke	1897	2	"	1 fair, 1 weak.
Reine Hortense	1895	2	"	1 fair, 1 dead, 1896.
" "	1897	1	"	Weak.
Shadow Amarelle	1893	3	Yes	2 strong, 1 dead, 1896.
Späte Amarelle	1895	2	"	1 strong, 1 dead, 1895.
Sparhawk's Honey	1897	1	No.	Strong.
Schmidt	1897	2	"	1 fair, 1 strong.
Tradescant's	1897	1	"	Fair.
Vladimer	1895	2	"	1 strong, 1 fair.
Wragg	1892	2	Yes	" "
Windsor	1892	3	"	2 strong, 1 dead, 1896.
"	1893	1	No.	Strong.
Yellow Spanish	1892	2	Yes	"

PLUMS.

Some of the plum trees are making strong and many only fair growth. They have so far fruited but little.

The plant louse which affects the plum, *Aphis prunifolii*, has been very troublesome, and the vigorous use of tobacco water is found to be the best remedy. The use of kerosene emulsion is also effective; but great care is necessary as the foliage is apt to be injured if the mixture is improperly made.

The following table gives the names of the varieties planted, and their present condition :—

Particulars relating to this orchard from 1892 to 1894, inclusive, are also given in the annual report for 1895. The plum orchard now contains 122 trees, including 51 varieties.

Name of Variety.	When Planted.	Number of Trees.	Fruited.	Condition of Growth.
Arch Duke	1895	2	No.	1 fair, 1 weak.
Abundance	1895	2	"	1 strong, 1 fair.
Bryanston's Gage	1897	2	"	Strong.
Burbank	1895	2	"	1 strong, 1 dead, 1896.
"	1897	1	"	Weak.
Beauty of Naples	1895	2	....	Dead, 1896.
Botan	1897	3	No.	2 fair, 1 weak.
Bradshaw	1892	3	"	2 fair, 1 strong.
Copper	1897	1	"	Weak.
Cheney	1897	2	"	Fair.
Czar	1895	2	"	Weak.
Coe's Golden Drop	1892	2	Yes.	1 strong, 1 fair.
Duane's Purple	1892	2	No.	" "
"	1897	2	"	" "
De Soto	1897	2	"	Fair.
Field	1897	2	....	Dead, 1897.
Fellenburg	1892	1	....	Dead, 1896.
"	1893	2	No.	Strong.
Goliath	1897	2	"	1 weak, 1 strong.
Gueii	1892	2	Yes.	Strong.
"	1893	2	No.	1 strong, 1 fair.
Golden Prolific	1893	2	"	1 weak, 1 dead, 1896.
Grand Duke	1895	2	"	1 strong, 1 fair.
Gen Hand	1897	2	"	Weak.
German Prune	1892	3	"	Strong.
Hawkeye	1895	2	....	Dead, 1897.
Hudson River Purple Egg	1893	1	No.	Weak.
" "	1897	1	"	"
Italian Prune	1895	2	"	1 fair, 1 dead, 1896.
Imperial Gage	1892	5	Yes.	4 strong, 1 fair.
" "	1893	2	"	Fair.
Jefferson	1897	2	No.	1 fair, 1 weak.
Kingston	1897	1	"	Fair.
Luscombe's Nonesuch	1897	2	"	Strong.
Lombard	1892	6	Yes.	"
"	1893	1	"	"
Lawrence's Favourite	1892	1	"	Fair.
Moore's Arctic	1892	3	"	Strong.
" "	1893	2	"	"
McLaughlin	1892	1	....	1 dead, 1895.
"	1897	1	No.	Weak.
Niagara	1892	2	"	1 fair, 1 dead, 1895.
"	1893	2	"	Fair.
Ouellin's Golden	1897	2	"	Strong.
Orange	1897	2	"	1 strong, 1 fair.
Ogon	1897	2	"	1 fair, 1 weak.
Prince of Agen	1897	2	"	Strong.
Prince Englebert	1897	2	"	"
Prince of Wales	1895	2	....	Dead, 1896.
Pond's Seedling	1892	3	Yes.	2 fair, 1 dead, 1896.
Prince's Yellow Gage	1892	6	"	Strong.
Prunus Simonii	1893	1	....	Dead, 1896.
Quackenboss	1897	2	No.	Strong.
Reine Claude	1892	2	Yes.	"
" "	1893	2	No.	Fair.
St. Lawrence	1897	2	"	"
Shipper's Pride	1892	3	Yes.	"
" "	1893	2	"	Strong.
Satsuma	1895	2	....	Dead, 1896.
Smith's Orleans	1895	2	....	Dead, 1895-96.
" "	1897	1	No.	Fair.
Saunders	1893	1	"	Weak.

PLUMS—*Concluded.*

Name of Variety.	When Planted.	Number of Trees.	Fruited.	Condition of Growth.
Shropshire Damson	1892	1	Yes	Fair.
Stanton	1892	2	No.	Strong.
Victoria	1897	2	"	1 weak, 1 fair.
Weaver	1895	1	....	Dead, 1897.
"	1897	2	No.	1 fair, 1 dead, 1897.
Washington	1892	2	"	Strong.
"	1893	1	"	"
Wangenheim	1897	2	"	Fair.
Willard	1895	2	"	Strong.
Yellow Egg	1895	2	"	1 strong, 1 dead, 1896.
Yellow Gage	1892	2	....	Dead, 1895.

PEACHES.

These two varieties of peaches were planted in 1897 in Orchard No. 2, where protection is afforded :—

Name of Variety.	Planted.	No. of Trees Planted.	No. of Trees Living.	Condition of Growth.
Alexander	1897	2	2	Strong.
Hale's Early	1897	2	2	"

APRICOTS.

These varieties are on peach stocks. Only the variety Gibb has made very promising growth. The branches kill back badly in winter, and in some cases, as will be seen from the following table the trees have killed out completely :—

Name of Variety.	Planted.	No. of Trees Planted.	No. of Trees Living.	Condition of Growth.
Acme	1897	2	1	1 dead, 1897 ; 1 weak.
Beckland	1895	2	1	" 1896 ; "
Gibb	1895	2	2	Strong.
Harris	1895	2	1	1 dead, 1896 ; 1 fair.

NUTS.

The following table will show the varieties of nuts grown and their condition of growth :—

Name of Variety.	Planted.	Number of Trees Planted.	Number of Trees Living.	Condition of Growth.
American Chestnut	1895	2	1	1 dead 1896 ; 1 fair.
Black Walnut	1895	2	2	Strong.
Filberts, Kentish Cob	1895	2	2	"
" Cosford Cob	1895	2	2	1 fair ; 1 weak.
Japanese Walnuts, Juglans Max	1895	2	2	Strong.
" " " Sieboldi	1895	2	2	"
Japanese Chestnut	1895	2	....	Dead 1896.

NUMBER and Varieties of Fruit Trees now growing in Orchards.

Name.	Number of Trees.	Number of Varieties.
Apples	336	149
Crab Apples	31	10
Pears	68	30
Cherries	78	36
Plums	122	51
Peaches	4	2
Apricots	5	4
Nuts	11	6
Total	655	288

SMALL FRUIT PLANTATION.

It seems to be a common practice for many of our farmers to order those varieties of small fruits which the agent recommends. In many cases the variety ordered is not the best, and too often failure is a result. It is not necessary when buying small fruits such as raspberries to get 50 or 100 plants, for by beginning with one dozen plants in a few years there will be plants enough to start a large plantation. The same can be said of strawberries, and 25 or 50 plants of two or three good varieties will enable one to make a start from which he can soon increase his plantation to any size he may wish.

The following chart gives the names of some of the most desirable varieties of small fruits to order, also the distances at which they may be planted. Should only one variety of each kind be wanted I would advise the first named :—

Name of Variety.	No. of Plants.	Rows distance apart.	Distance apart in the row.
		Feet.	Feet.
Strawberries :—			
Beder Wood. B	25 to 50	4	1
Crescent. P	25 " 50	4	1
Wilson, B	25 " 50	4	1
Warfield, P	25 " 50	4	1
Raspberries :—			
Red, Cuthbert	12 " 24	6	1
Red, Heebner	12 " 24	6	1
White, Golden Queen	12 " 24	6	1
Black, Gregg	12 " 24	6	1
Blackberries :—			
Agawam	12 " 15	7	3
Ancient Briton	12 " 15	7	3
Currants :—			
Black, Lee's Prolific	6 " 12	5	4
Red, Cherry	3 " 6	5	4
White, White Grape	3 " 6	5	4
Gooseberries :—			
Downing	6 " 12	5	4
*Industry	6 " 12	5	4
*Whitesmith	6 " 12	5	4

* English varieties.

ORNAMENTAL TREES AND SHRUBS.

The ornamental trees and shrubs now include 236 species and varieties, making a total of 448 individual specimens, many of which are making strong growth, some only fair, and others poor growth. In addition to the varieties planted in previous years and which were reported on in 1894 and in 1896, the following were planted this year :—

Betula pumila, Dwarf Birch.
Carya olivæformis, Pecan Nut.
Carpinus Caroliniana, American Hornbeam.
Cornus sericea, Dogwood.
Celtis occidentalis, American Hackberry.
Caryopteris Mastacanthus.
Comptonia asplenifolia, Sweet Fern.
Callicarpa purpurea.
Cornus sanguinea variegata, English Variegated Dogwood.
Cerasus serotina, Wild Black Cherry.
Euonymus Americanus. Strawberry Bush.
Halesia tetraptera. Snowdrop Tree.
Ilex opaca, American Holly.
Itea Virginica.
Juniperus Suecica, Swedish Juniper.
Ligustrum Stauntoni, Staunton's Privet.
Magnolia acuminata, Cucumber tree.
Nyssa multiflora, Sour Gum tree.
Neviusa Alabamensis.
Populus fastigiata, Lombardy Poplar.
" Van Geerti.
Paliurus aculeatus, Christ's Thorn.
Philadelphus coronarius semiplenus.
Pyrus rosea alba.
Robinia hispida, Rose Acacia.
Salix aurea pendula.
" Villarsiana.
" purpurea pendula.
" regalis.
" Salamoni.
" capraea.
" alba, White Willow.
Spiræa vaccinifolia.
Tamarix Indica.
Thuya occidentalis Meehan's Golden, Meehan's Golden Arbor-vitæ.
Thuya occidentalis Hoveyi Golden.
" " pumila.

DESIRABLE VARIETIES OF ORNAMENTAL TREES AND SHRUBS.

The following list of shrubs and trees can be safely recommended as good sorts for lawn planting, or for other ornamental purposes. These are all hardy varieties and have made a vigorous growth here :—

Deciduous Trees.

Acer platanoides, Norway Maple.
" rubrum, Red Maple.
" saccharinum, Sugar Maple.
Betula alba, European White Birch.
" purpurea, Purple Birch.
Fraxinus Americana, American Ash.
Larix Europea, European Larch.
Negundo aceroides, Box Elder.
Pyrus Aucuparia, European Mountain Ash.
Quercus Robur, English Oak.
Sophora Japonica, Japan Sophora.
Tilia Europæa, European Linden.
Ulmus Americana, American Elm.
" campestris, European Elm.
" racemosa, Cork Elm.

Evergreen Trees.

Abies balsamea, Balsam fir.
Picea pungens, Colorado Blue Spruce.
" Douglasii, Douglas Spruce.
" excelsa, Norway Spruce.
Pinus Austriaca, Austrian Pine.
" sylvestris, Scotch Pine.
Thuya occidentalis pyramidalis, Pyramidal Arbor-vitæ.

Deciduous Shrubs.

Artemisia Abrotanum, Southern wood.
Berberis Thunbergii, Japanese Barberry.
" vulgaris, Common Barberry.
" " purpurea, Purple Barberry.
Caragana arborescens, Siberian Pea-Tree.
Cornus alba, Red-twigged Dogwood.
Cotoneaster vulgaris, Common Cotoneaster.
Deutzia gracilis,
Diervilla (Weigelia) rosea, Rose flowered Weigelia.
Diervilla (Weigelia) candida, white flowered Weigelia.
Diervilla (Weigelia) Lonerii, Dark red Weigelia.
Elæagnus angustifolia, Russian Olive.
Hydrangea paniculata grandiflora, Japanese Hydrangea.
Lonicera, Tatarica, White flowered Bush Honeysuckle.
Lonicera Tatarica, Red flowered Bush Honeysuckle.
Lonicera chrysantha, Bush Honeysuckle.
Philadelphus coronarius, Mock Orange.
Potentilla fruticosa, Shrubby Cinquefoil.
Rhamnus catharticus, Common buckthorn.
Ribes aureum, Yellow Flowering Currant.
Rosa rubrifolia, Red-leaved Rose.
Sambucus Canadensis, Common Elder.
Sambucus Canadensis aurea, Golden-leaved Elder.
Spiræa opulifolia aurea, Golden-leaved Spiræa.
Spiræa van Houttei, van Houtte's Spiræa.
" callosa.
" " alba.
" Billardi.
Syringa Emodi.
" Josikæa, Josika's Lilac.
" Charles X, Charles X Lilac.
" vulgaris alba, White Lilac.
" " purpurea, Purple Lilac.
Viburnum Opulus, High bush Cranberry.
" sterilis, Common Snowball.
" Lantana, Pliant Viburnum.

Evergreen shrubs.

Juniperus Virginiana, Red cedar.
" communis, Common Juniper.
Pinus montana, Dwarf mountain pine.
Retinospora plumosa, Plumose retinospora.
" " Aurea, Golden pl. "
" filifera, Thread-like "
Thuya occidentalis globosa, Globose Arbor-vitæ.
Thuya occidentalis Hoveyi.
" " variegata.
Mahonia Aquifolium, Holly Barberry.

VEGETABLE GARDEN.

Generally speaking, our farmers do not pay the attention they should to the growing of vegetables, to supply at least their own tables during the greater part of the year. It is generally the case that only a small percentage of those that might be cultivated are grown, and those varieties which require much care and attention are not usually included in the average kitchen garden. It is too often the case that more expensive foods take the place of those which the farmer might grow for himself.

There is nothing more conducive to the general health than a good free use of garden vegetables ; not only that but from an economical standpoint their growth to supply a part of our daily food is worthy of our consideration.

The work of keeping a well laid out kitchen garden properly cared for is not great if done at the proper time. There is probably more thought required than actual time, and the result of good planning are more marked in this department of farm work than almost any other. To have the very earliest and best varieties of vegetables it is quite necessary that we bring to our aid the hot-bed and the cold-frame. These are within the reach of almost every farmer, and should form a part of every farm's equipment.

During the past four years experiments have been carried on with some of the different varieties of vegetables and in this report a summary is given of the results obtained, and at the same time some hints given on the management of a kitchen garden. The kitchen garden well furnished is a desirable adjunct to the farm not only for supplying the table with wholesome food, but also that the young may be interested in garden work and see something in farm life beyond the routine of general field work. The seed required for a kitchen garden can be divided into two groups those to be started under glass and those for the open ground. Of the former the most important are : cabbage, cauliflower, tomatoes, lettuce, onions and celery. The following observations may be of help to those who have never had any experience in the construction of a hot-bed or cold frame.

THE HOT-BED.

A hot-bed should be located where protection can be had from the cold north and westerly winds. A southern exposure protected on the north by a building, tight fence or a hedge will furnish a desirable spot.

Horse-stable manure is the best to produce a good reliable steady heat, this should not be "fire-fanged" nor should it contain too much straw. Sufficient to make a bed 7 feet square and 18 inches deep is taken to the spot selected and put in a good square pile. Any dry parts of this manure should be mixed with the wet, and in some cases it is advisable to use water to make all parts of as even a dampness as possible. All parts of this pile should be firmed alike, if this is neglected the less firm parts will be liable to burn out while the more compact will just begin to generate a heat. This pile should be left for 6 or 8 days, or until its steaming indicates that fermentation is well under way, when it should be forked over again and made into a similar pile. In 3 or 4 days the manure will be ready for the permanent bed. When placing the manure in the bed see that all the parts are firmed alike in order that the heat may be generated evenly and thus uniformity of temperature secured.

The frame to place upon the bed to support the sashes should be 6 feet square. Boards $1\frac{1}{2}$ inches thick are good material for the construction of a frame. Make the front 12 inches high and the back 18 inches, thus giving 6 inches for a southern slope to the sash. Bank the frame well around the outside with strawy manure, and inside put 5 inches of earth. The soil used should be a light loam of good quality. A good plan is to make a pile for this purpose the previous fall and cover it with strawy manure to keep it from freezing.

The above frame would support 2 sashes 3 x 6 feet in size. These would hold 3 rows of 10 x 12 inch glass. No cross bars are used, but bars running the length of the sash hold the glass. The lights are lapped like shingles about $\frac{1}{2}$ inch.

After the bed is finished allow it to stand for a few days ventilating it occasionally to allow the rank steam to go off. Often the temperature in a newly made bed will

run up to 100° making it desirable that we have a thermometer to determine the temperature. Seed should not be sown when the temperature is higher than 80°. From 45 to 50° Fahrenheit at night, and 75 to 80° during the day, have given good results here. In order to keep up such a temperature during very cold nights, the glass will have to be covered with mats, bags or straw. If such are used, they should be removed as soon in the morning as possible, as the early morning sun materially advances the growth of young plants.

During the day care and judgment must be exercised to ventilate according to the condition of the weather. A few hour's sun with no ventilation towards the middle of the day will sometimes do a great amount of damage. When water collects on the inside of the glass it shows that ventilation is required. In any case the frame should be closed about the middle of the afternoon thus preventing the bed from cooling too much before night.

Watering should not be neglected, but it should be done judiciously. Too much water should not be used especially if the weather is dark and cold, as the soil is liable to become soggy and sour, and the seeds, if not germinated, are liable to rot. Never water when the sun is shining brightly, for in doing so the foliage of the plant is liable to be injured. Keep in mind that success depends upon the bottom heat supplied from manure, the top heat from the sun, the giving of sufficient water and the necessary ventilation.

THE COLD-FRAMES.

Cold-frames are simply frames and sashes the same as those used on the hot-bed, the pit being filled with soil and no heat below. As soon as the plants started in the hot-bed are large enough, they are transplanted into cold frames where they grow stronger and stouter, and being gradually hardened may be transplanted to the open ground more successfully.

CABBAGE.

Of the different varieties of cabbage experimented with the following seven varieties have proved the most desirable :—

Seed sown in the hot-bed April 1. Transplanted to the cold frame April 29. Transplanted to the open ground May 10.

EARLY VARIETIES.

Extra Early Express.—The earliest variety tested, a firm conical shaped head, of medium size with few outside leaves. Can be planted about 20 inches apart in the rows.

Early Jersey Wakefield.—The best early variety. It is about four days later than the Express but has made better heads. Medium size with few outside leaves and conical in shape, of excellent quality. It can also be planted close.

MEDIUM EARLY VARIETIES.

Henderson's Succession.—A very attractive variety, heads large and even, firm, round and a good header. The best to head of all the varieties tested.

Vandergaw.—Considerably later than Succession ; a large round firm head, of excellent quality. It heads well and is a good keeper—one of the best all round cabbages.

LATE VARIETIES.

Marblehead Mammoth Drumhead.—A very large variety, a good header, and firm. Quality excellent, a good keeper. A very desirable late sort.

Late Flat Dutch.—Large solid, round, flat head, a good header ; quality excellent and a good keeper.

Mammoth Rock Red.—Deep red colour, heads large, round and firm, an excellent header. The best red variety so far cultivated here.

CABBAGE SEED SOWN IN THE OPEN GROUND.

Seed of the varieties, Succession and Vandergaw, sown on May 15, also on June 1, in the open ground produced an excellent crop of good keeping winter cabbage. The seed was sown in rows 3 feet apart, scattered at intervals of $2\frac{1}{2}$ feet in the rows, and thinned out to one plant when large enough. Cabbage grown this way have usually escaped the attack of the root maggot and are not set back by transplanting.

CAULIFLOWER.

For early cauliflower sow the seed in the hot bed April 1. Transplant to the cold frame April 20. Transplant to the open ground about the middle of May or earlier if possible. Cauliflower, as well as cabbage, will stand a light frost, and it is well where a few are wanted for early use to plant early and protect if necessary by covering. Those started early have made the best heads. Seed sown in the open ground along with cabbage have produced very fine heads for autumn use. The variety, Demi-Dur, gave the best results of the varieties sown in this way.

The following have been found to give the best results :—

Early—Early Snowball.—This is one of the earliest varieties and the most reliable in heading. Dwarf in habit it has a compact deep head, white, medium in size with short outer leaves. The plants can be set in rows $2\frac{1}{2}$ feet apart and 20 inches apart in the rows.

Early—Selected Early Dwarf Erfurt.—Dwarf and compact, with a large white head, solid and of excellent quality. Heads well, plant 24 inches apart in the rows.

Half Early—Demi-Dur, or Half Early Paris.—White solid compact head, a good header. This variety comes in well as a medium early variety. Has a large head of excellent quality.

Late—Large Late Algiers.—A favourite late variety, a sure header, producing large compact heads of excellent quality.

TOMATOES.

The past season was not favourable for the growth of tomatoes. The vines made strong growth and although vigorously cut back the fruit did not set well.

The seeds were sown in the hot-bed April 10. Transplanted to the cold frame May 3, and set in the open ground June 9. When removing the plants from the cold frame to the open ground a transplanter is used, thus considerable earth is lifted with the plant and the growth is but slightly checked. Of the red varieties tested the following four have proved the most desirable. They ripened in the order named.

Imperial.—Ripens its fruit well, of excellent quality, medium in size, solid, smooth The fruit is inclined to crack open badly. Fruit ripe August 22.

Fordhook's First.—Medium in size, ripens about the same time as the Atlantic Prize, August 30. The fruit is smooth, solid, of a deep red colour, quality excellent, and ripens up well.

Early Ruby.—Good form, smooth, solid. The earliest large sized tomato. The vines are open, allowing the fruit to ripen up evenly. The best market variety so far tested.

Conqueror.—A late variety but very prolific, the best variety to plant if unripe fruit is desired. Fruit large, medium smooth, solid and of good quality.

Golden Queen.—A bright yellow smooth fruit. The best yellow variety tested. Flavour good.

To ripen tomatoes after they have been picked.—This can be successfully done by putting them in a cool, dark, dry place. Fruit of a much better flavour and solidity can be had by ripening in this way than in some sunny part of the house as is generally the practice. When fruit is gathered for this purpose be careful not to bruise it, as careful handling is quite essential if good results are to be obtained.

CELERY.

About the last of March sow the seed in a flat box or a large flower pot is sometimes used. Sow the seed shallow and cover with a piece of white cotton, thus keeping the soil dark and moist. Water frequently but do not go to extremes. Place in a window or where a moderate heat can be obtained. About ten days after sowing the seed will begin to sprout. Remove the covering and be careful not to allow the earth to dry out. As soon as the plants are large enough to handle transplant to the hot-bed placing them in rows 3 inches apart and from ½ to ¾ of an inch apart in the row. Keep shaded for a day or two if the weather should be bright, and keep the plants well watered. With good plants secured early celery culture may be made a success. When the celery is ready to transplant to the open ground, make a trench by ploughing deep, and taking out the loose material with a shovel, put in this trench 6 or 8 inches of well rotted barnyard manure covering with earth and mixing well. Firm the ground well when it will be ready for the plants. If the plants are strong and vigorous the tip of the roots and top should be clipped off. Plant in rows 4 feet apart, and 5 inches apart in the rows. It is advisable to shade the plants for a few days after planting.

Not much cultivation other than an occasional hoeing is required. Should the season prove dry the plants should occasionally be thoroughly watered. For blanching the early crop of such varieties as the white plume, boards are successfully used placing one on each side of the row, and in a couple of weeks the celery is fit for use. Other varieties of celery for the late supply can be more thoroughly blanched by earthing up. This is done where only a limited quantity is grown by wrapping paper around the plants in September and banking with earth. Should paper not be used hold the plant firmly with one hand while the first earth is being placed around the plant, thus preventing the earth from getting in around the stalks, after which bank nearly to the top.

When storing for the winter, lift the plants with a spade allowing earth to adhere to the roots, pack upright in a deep box in about 6 or 8 inches of earth, place the box on an earth floor in a cool dry cellar. Essential requirements for keeping celery in winter are a cool temperature with roots moist and tops dry.

The following varieties are recommended as among the most desirable.

White Plume.—The finest early celery, of dwarf self-blanching habit. It is crisp and solid and has a rich nutty flavour. One of the finest fall and early winter varieties and blanches easily. It is not as good a keeper as the *Paris Golden.*

Paris Golden.—Being of the self blanching habit, it blanches easily. Not as early as the white plume but of a much larger growth. Has a compact solid growth, is crisp, and has a flavour that cannot be surpassed. It is a good keeper and the best early variety we have tested.

Giant Pascal.—Blanches quickly. Stalks are large, thick and crisp, and of a superior nutty flavour. It retains remarkable freshness after harvesting and is the best late market variety that we have grown, keeping well all winter.

LETTUCE.

There is no garden crop that will give as satisfactory returns for liberal cultivation and manure as lettuce. The value of the crop, as far as quality goes, depends largely upon the richness of the soil. Seed sown in the hot-bed, and transplanted to the open ground as early in the spring as possible, will give the earliest crop. To obtain a succession of crops, sow at intervals of two weeks in rows, in the open ground, and thin out or transplant to one foot apart, making the first sowing as early in the spring as possible. The varieties which have been most satisfactory for general use are as follows :—

Early Curled Silesia.—This is a valuable variety for forcing. It does not form a cabbage head, but the leaves are large and form a compact mass. The leaves are light green in colour, white inside, tender, crisp, and of fine flavour. It does not wilt readily, and stands well after cutting.

Hanson.—Forms a large, solid head, resembling a cabbage; white, crisp, tender, and quality excellent. Leaves green on the outside. One of the best for general culture. A standard market variety, and withstands dry weather well.

Paris White Cos.—The leaves of the Cos varieties do not form a head, are long, and require to be tied up to insure blanching; thus forming a bunch of tender, white, crisp leaves of excellent flavour. One of the best of the Cos type.

GARDEN PEASE.

Considering the great number of varieties of garden pease placed upon the market by the different seedsmen, experiments with as many varieties as possible was thought advisable. As a result of the information collected, the following three varieties can be safely recommended for general use :—

Little Giant.—Very early; medium sized pod; peas green, wrinkled, of delicious flavour. The vines are of very dwarf habit, and need no support. One of the most prolific early varieties.

Heroine.—Second early; large pod; peas wrinkled and large, of excellent quality. The vines grow about two feet high, are stiff, and will grow well without support. Very productive.

Stratagem.—One of the best varieties for general crop. Large pods, well filled; peas wrinkled, large, and of the finest flavour. Vines make strong growth about two feet high, and can be grown without support. Very prolific.

BEETS.

As soon as the ground can be prepared beet seed should be sown. If the seed is soaked in water for a few hours then put into a cotton bag and covered with earth for 24 hours before sowing, this treatment will promote early growth.

The following varieties are excellent for general use :—

Flat Egyptian Turnip.—A flat beet with dark-red, tender flesh of good quality. The earliest variety tested.

Extra Early Eclipse.—A globe-shaped, smooth beet of fine quality, deep red, tender flesh. Very few tops. Keeps well and is one of the best varieties for general crop.

Half Long Blood.—Long, smooth, dark-red, tender, flesh of excellent quality. A good keeper and fine winter variety.

EARLY TURNIPS.

The seed of these should also be sown as soon as the ground is fit.

Extra Early Milan.—The earliest variety we have tested. Rather a flat round bulb; flesh white, firm, and of excellent quality. It keeps well and is the best early market variety so far tested.

Early Golden Ball or Orange Jelly.—The best yellow variety tested; flesh bright yellow, firm, of good quality. Globe shape; a good keeper and valuable market variety. One of the best table sorts.

CARROTS.

Carrot seed can be sown as early as the ground is fit to work. Of the early garden and market sorts the following two varieties are entitled to a place among the best :—

Early Scarlet Horn.—A very early carrot, size small, quality excellent, skin orange red. Its shape is something similar to the Guerande. This variety is excellent for early crop.

Guerande or Oxheart.—One of the best varieties for general crop. Growth short and large, tapering abruptly to a small tap root. A deep red coloured carrot of very fine quality.

PARSNIPS.

Parsnip seed does not germinate readily and care should be taken to properly prepare the soil. Cover the seed not more than half an inch deep, and when up thin to 4 inches apart.

Parsnips not wanted for winter use can be left in the ground all winter in this climate and can be used as soon as the frost is out of the ground in the spring. Frost seems to improve the quality of these roots.

Guernsey.—A half-long variety best adapted to a shallow soil, of excellent quality, and a very desirable sort.

Hollow Crown.—Long, white and smooth ; sweet and tender. A favourite variety, and its culture is recommended, although it is harder to gather than the Guernsey.

GARDEN CORN.

For early corn the liberal use of well rotted barn-yard manure, or even better that from the pig-yard, is quite essential. Plant the corn in hills 3 feet apart and about 5 kernels to the hill ; put a good forkful of manure under each hill and sow the seed about the second week in May 1 inch deep. Give frequent culture if the best results are to be obtained.

The following varieties have proven the best here for general use :—

Early White Cory : A very early white sweet corn, of excellent quality, very productive.

Extra Early Marblehead : Later than the Cory, of excellent quality, white and sweet. A prolific and promising sort.

Mitchell's Extra Early : A very early corn, white, of good quality, one which produces well.

CUCUMBERS.

For early cucumbers plant in the hot-bed about the middle of April, and as soon as danger from spring frosts is over transplant, being careful that the earth around the roots is disturbed as little as possible. This can best be done by thoroughly soaking the ground and using a transplanter. For general crop plant in the open ground from the 10th to the 15th May. By removing from 10 to 12 inches of the top soil ; filling in with manure, and covering with from 4 to 6 inches of earth, a very suitable place for growing cucumbers can be obtained. The following varieties have given good results :

Siberian : The earliest variety tested, grows from 4 to 5 inches long, and is very prolific.

White Spine : The most promsing sort for general culture, grows from 8 to 12 inches long, and when cut young are excellent for pickling.

Chicago Pickling : A small growing variety used entirely for pickling, the most prolific of the pickling sorts tested.

SQUASH.

The different varieties of squash can be easily divided into two quite distinct kinds —bush and running. The Bush Scallop and Summer Crookneck belong to the former and can be planted in rows 6 feet and 4 feet apart in the rows ; the later and running sorts 12 feet apart each way When preparing the hills use a liberal amount of barn-yard manure. Throw out the surface soil, put in the manure and cover with from 4 to 6 inches of earth. The following 3 varieties are very prolific and on account of their superior quality can be safely recommended.

Summer Crookneck : Bush habit of growth, very early ; fruit long with a crooked neck, orange yellow colour, flesh firm and of excellent quality. Gives the best satisfaction of all the early varieties.

Essex Hybrid: Of a running habit, resembles the Turban Squash in appearance, but is much superior in quality. It has a hard shell and is an excellent keeper. Flesh thick, solid, fine grained, dry, sweet and of superior flavour. It has a rich yellow colour, is quite early and a very desirable sort.

Hubbard: A well known standard variety. Large, green, late, a good keeper, of excellent quality, fine grained and dry. One of the best for late winter use.

EXHIBITIONS ATTENDED.

An exhibit has been prepared of the products of the Maritime Experimental Farm, which were shown at the Charlottetown, P.E.I., exhibition, from 21st to 24th of September, also at the Nova Scotia provincial exhibition at Halifax, from September 28th to October 5th, and at the Westmoreland County exhibition, Sackville, N.B., October 14th. This exhibit included many of the varieties of fruits, besides the varieties of grains and grasses, grown on the farm.

AGRICULTURAL MEETINGS.

I attended the Nova Scotia Fruit Growers' Association at Wolfville, N.S., from January 19th to 22nd, also the Nova Scotia Farmers' Association at Middleton from the 26th to 29th January. Attended and took part in the meetings of the New Brunswick Farmers' Association at Fredericton, N.B., February 9th to 12th; the Colchester County Fruit Growers' Association, Truro, N.S., January 19th; and agricultural meetings at Jeffries' Corner, King's County, N.B., February 16th; Penobsquis, King's County, N.B., February 17th; and, at Point de Bute, West Co., N.B., February 26th.

Addressed farmers' meetings, called by Mr. W. W. Hubbard, secretary of the New Brunswick Farmers' Association, as follows:—

March 10th, Westfield, King's Co., N.B.
" 12th, Clifton "
" 13th, Central Norton "
" 15th, Berwick "
" 17th, Carsonville "
" 18th, Corn Hill "
" 23rd, Elgin, Albert Co., N.B.
" 26th, Harvey "
" 30th, Shediac, West Co., N.B.
April 5th, Baie Verte "
" 7th, Great Shemogue, West Co., N.B.
" 9th, Upper Cape "
May 3rd, Jolicure "

I have the honour to be, sir,
Your obedient servant,

W. S. BLAIR,
Horticulturist.

Appearance of grounds surrounding house of Superintendent, Experimental Farm, Brandon, Manitoba, at time of building.

Appearance of grounds surrounding house of Superintendent, Experimental Farm, Brandon, Manitoba, three years after grading and planting, with addition of verandah.

EXPERIMENTAL FARM FOR MANITOBA.

BRANDON, MAN., 30th November, 1897.

To DR. WM SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith to you my tenth annual report with details of the experiments undertaken and work accomplished on the Brandon Experimental Farm during the past year.

Although the past season has generally been a very favourable one for the Manitoba farmer owing to the excellent quality of wheat and the high prices obtained for all kinds of farm produce, it has not been as favourable as usual for experimental purposes, especially with the oat crop on account of the prevailing severe wind storm and frost in the early part of the season.

The rainfall throughout the provinces during the growing season was very variable, the eastern portions generally having a plentiful supply while in the western districts it was considerably below the average, on this farm the rainfall was about 50 per cent of either of the two previous years, two inches only falling during June and July the two most critical months of the season.

The last week of May and first of June were noticeable for very low temperatures and high wind storms, which was very disastrous to the oat crop in exposed situations, the one-tenth acre plots devoted to the varietal test of oats suffering severely.

The benefit of hedges and shelter belts was very clearly demonstrated at this time, the grain growing on portions of the farm protected ever so slightly by a hedge or windbreak escaped injury from drifting soil and when this was followed by severe frost the unbruised plants in the protected areas were not frozen while the exposed grain was in many instances completely killed.

Fortunately the test plots of wheat and barley were uninjured by frost or wind and the results from them were very satisfactory.

There has been an almost total absence of rust among the grain crops and very little smut.

I beg to draw special attention to that portion of my report devoted to grasses and clovers, this very satisfactory series of plots has attracted considerable attention during the year and may open up the way to a more general cultivation of grasses and especially clovers in this country where nitrogenous gathering plants are so much needed.

Owing to the light rain-fall the yield of all fodder crops was below the average, but the favourable weather enabled them to be stacked in good condition.

No injury whatever was experienced from fall frosts, the grain all being harvested before there was any injury from this cause.

EXPERIMENTS WITH WHEAT.

Although the yield of wheat throughout the province has generally been much below the average, the returns of this cereal on the experimental farm has been about the average and the quality and weight much better than usual, owing to patches of scrub land many fields on this farm will not usually produce No. 1 Hard, but this year all fields and plots of Red Fife graded No. 1 hard and No. 1 extra.

Although the $\frac{1}{10}$ acre plots of wheat were grown in the same field as the oats and suffered equally from the winds of May; the frosts during that month and early in June

did not appear to injure the wheat plants and the crop was a very even one and the several experiments with wheat very satisfactory.

As usual Red and White Fife and White Connell are near the head of the list for productiveness and every effort is being made on this farm to improve the quality and productiveness of these excellent varieties.

Velvet Chaff, generally known here as Blue Stem, is being highly recommended by many farmers in this country, but we have found it no more productive than Red Fife and generally about five days later than that variety, an obvious disadvantage in this climate.

In addition to the varietal test of wheat will be found the following experiments in connection with wheat growing ; different ways of summer-fallowing, preventatives of drifting soil, wheat on stubble and fall and spring ploughed land, preventatives of smut in wheat, sowing at different dates, &c.

The varietal test included thirty-nine varieties all were sown on 26 April, on black sandy loam. The size of the plots was one-tenth of an acre each and there was no injury from rust in any case.

WHEAT—Test of Varieties.

Name of Variety.	Date of Ripening.		Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre		Weight per Bush.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
White Fife	Aug.	19	115	42	Stiff	3¼	Beardless	3,570	40	30	61
White Russian	"	19	115	36	"	3	"	3,370	36	20	62
Red Fife	"	19	115	36	"	3½	"	3,080	35	20	61
Golden Drop	"	16	112	32	"	3	"	2,700	34	10	62
Monarch	"	20	116	41	"	3	"	3,310	34	..	61
Crown	"	14	110	41	"	3½	Bearded	2,870	33	..	59½
White Connell	"	23	119	37	"	3	Beardless	3,190	32	40	62
Wellman's Fife	"	23	119	34	"	3½	"	2,450	32	30	61
Blenheim	"	16	112	37	"	3	Bearded	3,110	31	30	60
Velvet Chaff or Blue Stem	"	24	120	42	"	2½	Beardless	3,370	31	20	60
Vernon	"	13	109	29	"	2½	Bearded	2,730	31	10	62
Emporium	"	20	116	36	"	3	"	3,490	31	..	61
Pringle's Champlain	"	19	115	33	"	3	"	2,790	31	..	61
Percy	"	16	112	41	"	3½	Beardless	2,610	30	40	62
Admiral	"	19	115	38	"	3½	"	2,870	30	30	61
Advance	"	16	112	36	"	4	Bearded	2,790	30	10	60
Hungarian	"	14	110	33	"	2½	"	2,640	30	10	62
Alpha	"	16	112	36	"	3	Beardless	2,370	29	40	60½
Beaudry	"	14	110	33	"	2	Bearded	2,670	29	40	62
Red Fern	"	19	115	34	"	3	"	2,900	29	10	61
Campbell's White Chaff	"	17	113	32	"	3¼	Beardless	2,640	28	30	61½
Colorado	"	14	110	40	"	3¾	Bearded	2,690	28	30	61
Rio Grande	"	15	111	32	"	3½	"	2,430	27	50	61
Preston	"	20	116	49	"	3	"	3,120	27	10	61½
Goose	"	20	116	42	Weak	2½	"	2,710	26	30	62½
Dion's	"	19	115	33	Stiff	2½	"	3,470	26	20	61
Rideau	"	19	115	33	"	2½	Beardless	2,190	26	..	60½
Old Red River	"	18	114	35	"	3	"	1,890	26	..	61
Dawn	"	13	109	26	"	2½	"	2,740	26	..	62½
Herrison Bearded	"	15	111	27	"	1	Bearded	2,370	25	30	63
Dufferin	"	17	113	33	"	3	"	2,170	24	40	60½
Countess	"	16	112	34	"	3	Beardless	2,540	24	20	61½
Ladoga	"	14	110	36	"	3	Bearded	2,690	24	20	59
Black Sea	"	14	110	33	"	3	"	3,240	23	30	59½
Progress	"	20	116	35	"	3	Beardless	2,570	23	.	62
Captor	"	20	116	38	"	3	"	4,390	22	40	61
Stanley	"	16	112	33	"	3	"	2,900	22	30	61
Beauty	"	18	114	33	"	3	"	1,800	22	30	59
Huron	"	16	112	35	"	3	Bearded	2,060	22	20	62

TEST OF DIFFERENT WAYS OF SUMMER FALLOWING.

It is claimed by some of our leading farmers that land can be ploughed in the early part of the season, a crop of green fodder taken off or pastured, and as large a yield of wheat obtained the following year as could be had from a bare fallow.

The following table shows the result of a series of plots devoted to this test.

The ploughing for all was done on the 22nd May, the oats on plot 3 were cut when in the milk stage, and yielded $2\frac{1}{2}$ tons of dry fodder per acre, cattle were first turned into plot 1 when the oats were nine inches high.

The size of plots for this test were $\frac{1}{10}$ acre, the soil a strong black loam, and the seed was sown on the 28th of April.

From the foregoing table it would appear—

1. That sowing oats at the end of May and cutting them for green fodder lessened the yield of wheat the following year.

2. That where oats were sown on the 31st July and fed off the yield of wheat was somewhat larger than was obtained from bare fallow.

Name of Variety.	How treated during 1896.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.	Lbs.	Bus.	lbs.	Lbs.
Red Fife....	Oats sown in July and fed off..	Aug. 20	114	33	Stiff ..	$3\frac{1}{2}$	2,790	34	20	$61\frac{1}{2}$
"	Ordinary bare summer fallow........	" 20	114	37	" ..	$3\frac{1}{2}$	3,130	32	50	61
"	Oats sown in spring and cut.........	" 19	113	36	" ..	$3\frac{1}{2}$	1,130	22	50	61

TEST OF PREVENTIVES FOR DRIFTING SOIL.

Certain classes of soil, when cultivated for a number of years, have a tendency here to drift badly in high winds, bruising some of the grain plants and uncovering the roots of others, and thereby greatly lessening the yield.

With a view of ascertaining whether different modes of sowing have any effect in lessening this evil, a number of plots on one of the most exposed parts of the farm were sown to wheat with different machines or at varying depths.

Owing to the prevailing wind storms being more northerly than usual, these plots were not as badly drifted as they have been in other years, still the results are suggestive.

All the plots were sown on 14th May, on summer fallow ; soil, a light loam ; size of plots, $\frac{1}{10}$ acre.

Name of Variety.	How Sown.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.	Lbs.	Bus.	lbs.	Lbs.
Red Fife....	Shoe drill, 4 inches deep.............	Aug. 26	107	34	Stiff ..	$2\frac{1}{2}$	2,650	32	30	$61\frac{1}{2}$
"	" 3 "	" 26	107	34	" ..	3	2,380	32		61
"	" 1 "	" 26	107	37	" ..	3	2,730	29	30	61
"	Hoe drill...........................	" 26	107	35	" ..	3	2,750	29	10	61

RESULTS.

1st. The yield from the grain sown with the shoe drill exceeded that sown with the hoe drill by two bushels and fifty pounds per acre.

2nd. The yield increased in proportion to the depth of sowing. Many plants on the shallow sown plot were injured, which somewhat delayed their ripening.

FALL OR SPRING PLOUGHING FOR WHEAT.

This test has given the result usually obtained on this farm, the spring ploughing giving the largest return; this agrees with the experience of many Manitoba farmers on similar soil, but under the system of farming generally adopted here there does not appear to be sufficient time in the spring to plough for wheat.

For comparison the yield of an adjoining plot of summer fallowed land is given.

The soil was a black loam and the size of plots $\frac{1}{10}$ acre each.

Name of Variety.	How prepared.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
					In.		In.	Lbs.	Bsh	Lbs	Lbs
Red Fife ...	Summer fallowed	Apr. 26.	Aug. 19	115	36	Stiff ..	3½	3080	35	20	61
" ...	Spring ploughed..........	" 26.	" 16	112	32	" .	3	2620	29	40	60
" ...	Fall ploughed.............	" 26.	" 16	112	33	" .	3	2200	26	40	59½

PREPARING STUBBLE LAND FOR GROWING WHEAT.

In some districts increased areas are being sown on clean unploughed stubble, the second crop after fallow, but there is a great difference of opinion regarding the most suitable treatment for such land.

Four plots each $\frac{1}{10}$ acre were selected for this test, the soil was a moderately rich black loam.

The burning and disc harrowing of the stubble was all done in the spring, and the sowing was made with a drill.

Size of plots $\frac{1}{10}$ acre, soil a moderately rich loam.

Name of Variety.	How treated.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				Inch.			In.	Lbs.	Bsh	Lbs	Lbs
Red Fife....	Disced on burnt stubble...	May 3..	Aug. 18.	107	33	Stiff ..	3	2260	30	40	61
"	Drilled on burnt stubble....	" 3..	" 18.	107	33	" ..	"	1860	24		61
"	" on unburnt stubble .	" 3..	" 18.	107	34	" ..	3½	2480	23	40	61
"	Disced on " "	" 3..	" 18.	107	33	" ..	3	2040	22	40	61

THE TREATING OF SEED WHEAT FOR SMUT.

Although experiments for the prevention of smut in wheat have been conducted here for a number of years, it is still one of the principal subjects dealt with by correspondents; for that reason it was thought advisable to repeat the experiments again this year.

From the accompanying table, it will be seen that the result of the test is very emphatically in favour of bluestoning. This result, however, should not encourage any one to sow smutty wheat, even when treated, if clean seed can be procured.

The proper use of bluestone is to prevent comparatively clean wheat from becoming smutty rather than to encourage the sowing of wheat already badly affected.

The size of the plots used for this test was $\frac{1}{10}$ acre, the soil a light loam, and both were sown on 12th of May.

Variety.	How treated.	When Ripe.	No. of Days Maturing.	No. of smutty heads on three feet square.	No. of good heads on three feet square.	Yield per Acre.		Pounds per Bushel.
						Bush.	Lbs.	Lbs
Red Fife, very smutty.. ..	Not treated....................	Aug. 26	106	435	95	8	40	46
" "	Blue stone sprinkled, 1 lb. to 10 bushels......................	" 26	106	84	355	20	10	59

EARLY, MEDIUM AND LATE SOWINGS.

The Red Fife wheat plots in this series are particularly regular in the yields and dates of maturing; the second sown plot as usual giving slightly the largest yield.

The injurious effects of the severe wind storms and frosts of May and June are very apparent on the earlier sown oats; the two earliest sown being completely killed out and the third plot of Abundance badly injured.

Its effect is also shown in the uneven ripening of this grain, the early sown plots being thin the plants continued to stool out and did not ripen in some instances as early as the later sown plots.

The Canadian Thorpe barley is evidently more susceptible to injury from frost than Odessa, as two plots of the former were destroyed from this cause, while no injury was apparent to the Odessa.

The third and fourth sown plots of Golden Vine pease were so badly mixed by a severe wind storm soon after cutting that it was impossible to keep the yields separate; this frequently occurs with pease here if sown alone. The only preventative I know for this is to sow oats with them at the rate of two pecks per acre, the combined crop can then be cut with a binder and stooked the same as any other grain.

All these plots were sown on summer fallow with a hoe drill. Soil a clay loam, uniform in character.

Wheat—Early, medium and late sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Red Fife.	April 28..	Aug. 17..	111	37	Stiff..	3	Beardless...	2,330	32	50	61½
"	May 5..	" 23..	110	35	" ..	3	" ...	2,370	33		61½
"	" 12..	" 25..	105	36	" ..	3½	" ...	2,640	31		61½
"	" 19..	" 31..	104	33	" ..	3½	" ...	2,750	30	50	60
"	" 26..	Sept. 2..	99	37	" ..	3½	" ...	2,690	26		60
"	June 2..	" 11..	101	32	" ..	3½	" ...	1,820	21	20	59½
Stanley	April 28..	Aug. 14..	108	39	" ..	3½	" ...	2,290	26		61
"	May 5..	" 23..	110	34	" ..	3½	" ...	1,990	21	50	61
"	" 12..	" 25..	105	39	" ..	3½	" ...	2,080	21	10	60
"	" 19..	" 27..	100	38	" ..	3½	" ...	2,490	26		61
"	" 26..	" 31..	97	39	" ..	3½	" ...	2,620	20	30	60
"	June 2..	Sept. 4..	94	38	" ..	4	" ...	3,540	15	10	58

Oats—Early, medium and late sowings.

Banner	April 28..	......	......	....	.....	.....	Killed by	wind &	frost.		
"	May 5..	......	......	....	.....	.....	"	"	"		
"	" 12..	Aug. 25..	105	42	Stiff..	9	Branching..	3,280	44	24	34
"	" 19..	" 23..	96	41	" ..	7	" ..	2,700	54	24	35
"	" 26..	" 25..	91	42	" ..	8	" ..	3,730	41	26	34
"	June 2..	" 31..	90	40	" ..	8½	" ..	3,900	29	14	33
Abundance......	April 28..	....	....	....	....	....	Killed by	wind &	frost.		
"	May 5..	....	....	....	....	....	"	"	"		
"	" 12..	Aug. 27.	107	42	Stiff..	8	Branching..	3,930	27	2	34
"	" 19..	" 25..	98	42	" ..	9	" ..	2,540	48	28	34
"	" 26..	" 23..	89	41	" ..	8	" ..	3,990	31	6	34
"	June 2..	" 25..	84	42	" ..	8	" ..	4,090	25	10	33

Barley—Early, medium and late sowings.

Odessa	April 28..	Aug. 14..	108	23	Stiff..	2½	6 rowed.....	1,860	20	30	47
"	May 5..	" 18..	105	29	" ..	3	"	2,240	22	4	47
"	" 12..	" 18..	98	31	" ..	2	"	1,970	31	42	49
"	" 19..	" 19.	92	29	" ..	2½	"	1,880	32	34	49
"	" 26..	" 20..	86	29	" ..	2	" ...	2,280	35	40	49
"	June 2..	" 31..	90	29	" ..	2	"	2,340	31	22	47
Canadian Thorpe.	April 28..	....	....	....	......	....	Destroyed by	wind &	frost.		
" .	May 5..	....	....	....	......	....	"	"	"		
" .	" 12..	Aug. 31..	111	30	Stiff..	3	2 rowed.....	2,380	21	12	48
" .	" 19..	" 31..	104	33	" ..	3½	"	2,180	28	26	49
" .	" 26..	Sept. 4..	101	30	" ..	3	"	3,700	25		49
" .	June 2..	" 11..	101	32	" ..	3	"	2,960	24	38	48

PEASE—Early, medium and late sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	In.		Bush.	Lbs.	Lbs.
Golden Vine..................	April 28..	Aug. 20..	114	26	2½	Small	27	30	64
"	May 5..	" 22..	109	40	2½	"	27	10	64
"	" 12..	" 30..	110	34	2¼	"	60	50	64*
"	" 19..	Sept. 3..	107	34	2¼	" ...			
"	" 26..	" 9..	106	38	2½	"	34	10	63
"	June 2..	" 12.	102	40	2½	"	28		63
Mummy......	April 28..	Aug. 22..	116	28	3½	Medium ...	27		64
"	May 5..	" 30..	117	29	3	"	20	50	64½
"	" 12..	Sept. 1..	112	30	3	"	29	50	64
"	" 19..	" 8..	112	33	3	"	30	20	63½
"	" 26..	" 10..	107	40	3	"	33	30	63
"	June 2..	" 13..	103	42	3	"	25	30	63

* The crop from these two plots was badly mixed by a wind storm after cutting and the yield given is the product of both.

EXPERIMENTS WITH OATS.

More injury was done to the oat crop by spring frost last May than during any year in the history of the province, where the frost was preceded by drifting soil, carried by strong winds, many fields of oats were either completely destroyed or the plants so badly thinned that weeds took possession of the ground choking out the grain.

In the varietal test of oats on this farm, 15 varieties were completely killed out, 11 badly injured and many others more or less thinned ; depending on their exposure to the high north-west winds of 29th May ; for this reason the results obtained from the series of plots planted as a comparative test of varieties are unfortunately this year of little or no value for the purpose designed.

All the plots uninjured by wind and frost gave a fair yield of grain and the straw was unusually free from rust ; the seed of all varieties was immersed for five minutes in a bluestone liquid composed of 1 pound bluestone to 3 pails (24 quarts) of water before sowing and very little injury was done by smut.

Sixty-one varieties of oats were sown with a hoe drill, all on 1st May, on $\frac{1}{10}$ acre plots, soil a fairly rich black loam which had been summer-fallowed.

OATS—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs
Golden Tartarian	Aug. 23	114	42	Stiff	12	Sided	2,760	83	18	33
New Electric	″ 18	109	37	Weak	8	Branching	3,040	78	8	36
Early Golden Prolific	″ 18	109	42	Stiff	8	″	2,640	76	26	37
Joanette	″ 21	112	29	Weak	6	″	3,120	71	16	36½
California Prolific Black	″ 23	114	42	Stiff	8	Sided	3,120	68	8	36
Rosedale	″ 20	111	41	″	8	Half sided	3,410	67	12	36½
Pearce's Black Beauty	″ 20	111	40	Weak	10	Branching	2,770	67	2	36
Pense	″ 25	116	44	Stiff	10	Sided and half sided	3,550	64	24	36
Russell	″ 18	109	42	″	10	Half branch'ng	2,870	62	22	35
Golden Beauty	″ 20	111	42	″	9	Branching	2,650	57	12	34
Siberian O. A. C	″ 25	116	42	″	10	″	3,260	57	2	34
Early Etampes	″ 25	116	42	″	9	″	3,690	56	6	33
Prize Cluster	″ 10	101	42	″	11	″	2,140	56	6	38
Holstein Prolific	″ 20	111	42	″	9	″	3,130	55	..	34
Scotch Hopetoun	″ 25	116	38	Weak	9	″	4,290	54	24	36
Banner	″ 19	110	42	Stiff	9	″	3,240	53	8	34
Columbus	″ 25	116	38	″	9	″	3,220	52	12	35
Victoria Prize	″ 18	109	43	″	9	″	2,480	52	2	38
Coulommiers	Sept. 4	126	44	″	9	″	4,080	52	2	35
Early Maine	Aug. 24	115	39	″	8	″	3,030	52	2	34
Early Blossom	″ 20	111	42	″	10	Half sided	3,690	51	26	35
White Schonen	″ 29	120	42	″	6	Branching	3,190	50	10	33
Oxford	″ 19	110	41	″	10	Branching and half sided	3,490	48	28	35½
Miller	″ 19	110	35	″	6	Branching	3,160	48	8	34
Flying Scotchman	″ 19	110	42	″	10	″	3,940	47	12	37½
Improved Ligowo	″ 25	116	40	″	8	″	2,590	47	12	37½
Early Archangel	″ 18	109	39	″	7	″	3,370	46	16	37
Mortgage Lifter	″ 10	101	42	″	10	″	2,480	44	26	35
Master	″ 25	116	42	″	8	Branching and half sided	3,040	44	14	35
King	″ 19	110	36	″	7	Branching	3,460	42	12	31
Wallis	″ 25	116	42	″	10	″	3,370	39	4	35
Abundance	″ 25	116	49	″	9	″	3,530	38	28	34½
Newmarket	″ 11	102	42	″	9	″	2,480	38	28	34
Dunn	Sept. 4	126	44	″	10	″	3,980	37	12	34
Lincoln	Aug. 25	116	40	″	8	″	3,080	37	12	36
Oderbruch	″ 19	110	40	″	7	Half branch'ng	3,040	37	2	35½
White Russian	″ 25	116	42	″	11	Branching	4,630	35	30	34
Welcome	″ 13	104	38	″	10	″	2,860	35	..	38
Winter Grey	″ 24	115	42	″	9	″	3,060	35	..	37
Abyssinia	″ 31	122	42	″	10	Half sided	3,850	33	28	34
Green Russian	″ 14	105	40	″	8	Branching	3,780	32	32	32
Hazlett's Seizure	″ 24	115	42	″	10	″	3,290	32	22	35
Medal	″ 26	117	42	″	9	Branching and half sided	3,080	31	16	35
Rennie's Prize White	″ 18	109	44	″	10	Branching	2,640	29	24	38
Poland	″ 20	111	42	″	10	″	2,940	28	8	36
Imported Irish	″ 23	114	41	″	9	″	3,340	28	8	38
Cream Egyptian	″ 19	110	42	″	9	Half sided	3,340	26	26	37
Excelsior	″ 8	99	34	″	8	Branching	480	21	6	34
Doncaster Prize	″ 20	111	37	″	7	″	3,360	20	10	36
Wide Awake	″ 25	116	39	″	8	″	3,870	18	18	35

Excelsior was extremely early, for that reason birds gathered on this plot and destroyed a large proportion of the grain.

OATS TEST OF VARIETIES ON SPRING-PLOUGHED WHEAT STUBBLE.

Many farmers have the impression that Banner Oats may possibly prove the most prolific variety on summer-fallowed land, but that Black Tartarian gives the largest yield on spring-ploughed stubble.

From the accompanying table, it will be seen that in this instance the Black Tartarian equalled the Banner Oats in yield, a result which is seldom obtained on summer-fallowed land.

The soil on these plots was a moderately rich black loam, size of plots, $\frac{1}{20}$ acre; sown with a shoe drill.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Abundance	May 3..	Aug. 13.	102	34	Stiff ..	7	Branching	1,790	41	16	42
Banner	" 3..	" 14.	103	35	" ..	7	" ..	1,450	36	26	43
Black Tartarian.. ...	" 3..	" 16.	105	33	" ..	8	Sided.....	1,050	36	26	44
White Russian.	" 3..	" 16.	105	36	" ..	7	Branching	1,810	35		44

EXPERIMENTS WITH BARLEY.

The barley plots fortunately were sown this year somewhat later than usual, and escaped injury both from wind and frost; the test as a comparison of varieties was a very successful one, and the yield good for such a dry year.

The size of the plots for both six and two-rowed varieties was $\frac{1}{10}$ acre, and the soil a clay loam, which had been summer-fallowed. Thirty-eight varieties were tested, twenty of six-rowed and eighteen of two-rowed, and all were sown on the 13th of May. No rust occurred on any of the plots.

BARLEY, SIX-ROWED.—Test of Varieties.

Name of Variety.	Date of ripening.	Number of Days maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			Inch.		Inch.	Lbs.	Bush.	Lbs.	Lbs.
Trooper..........................	Aug. 17..	96	28	Stiff....	$2\frac{1}{2}$	2,690	51	12	50
Summit..........................	" 19..	98	33	" ...	$3\frac{1}{2}$	3,240	50	10	49
Excelsior..........................	" 11..	90	34	" ...	$3\frac{1}{2}$	2,640	49	8	40
Champion..........................	" 11..	90	38	" ...	3	2,910	47	34	37
Success	" 10..	89	28	" ...	3	1,950	44	38	40
Common..........................	" 11..	90	29	" ...	3	2,310	43	26	50
Rennie's Improved	" 16..	95	33	" ...	2	2,000	42	34	49
Nugent	" 17..	96	28	" ...	3	2,180	41	2	48
Odessa..........................	" 17..	96	33	" ...	3	2,300	40	30	$48\frac{1}{2}$
Phœnix	" 17..	96	32	" ...	$2\frac{1}{2}$	2,260	39	18	51
Surprise..........................	" 20..	99	30	" ...	3	2,980	38	46	51
Petschora	" 25..	104	31	" ...	2	2,230	35	40	47
Oderbruch..........................	" 16..	95	34	" ...	3	2,490	34	28	49
Mensury	" 17..	96	33	" ...	4	2,400	34	18	49
Stella..........................	" 23..	102	31	" ...	3	2,590	33	26	$48\frac{1}{2}$
Baxter's..........................	" 18..	97	32	" ...	2	2,580	32	34	51
Vanguard	" 16..	95	30	" ...	$2\frac{1}{2}$	2,090	29	18	49
Pioneer	" 24..	103	31	" ...	3	2,600	29	8	52
Blue..........................	" 14..	93	30	" ...	$2\frac{1}{2}$	1,870	27	34	48
Royal..........................	" 16..	95	27	" ...	$2\frac{3}{4}$	3,330	25	20	49

BARLEY, TWO-ROWED—Test of Varieties.

Name of Variety	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Sidney	Aug. 17	96	30	Stiff	3½	3,010	46	32	53
Pacer	" 20	99	34	"	3½	3,630	46	12	52
Nepean	" 20	99	32	"	3½	3,340	46	2	50
French Chevalier	" 23	102	32	"	5	3,610	43	26	48
Thanet	" 24	103	30	"	5	3,480	42	4	50
Victor	" 20	99	32	"	3½	3,480	42	4	51½
Emerson	" 19	98	31	"	3	2,710	40	20	51
Bolton	" 17	96	32	"	3¾	2,320	37	4	52
California Prolific	" 20	99	32	"	3	2,750	36	22	47
Prize Prolific	" 24	103	31	"	5	4,030	34	38	49
Beaver	" 20	99	28	"	3½	2,710	34	8	52
Rigid	" 17	96	31	"	3	2,240	32	24	47½
Danish Chevalier	" 24	103	33	"	4	3,340	30	20	48
Canadian Thorpe	" 25	104	33	"	3	3,180	23	16	48
Duckbill	" 20	99	30	"	3	2,830	22	14	48½
Newton	" 23	102	33	"	3	2,840	22	4	49
Monck	" 23	102	34	"	3½	3,770	21	22	51
Kinver Chevalier	" 25	104	32	"	4½	3,230	21	12	48

EXPERIMENTS WITH PEASE.

For the first time in the history of the farm the crop of field pease was injured by spring frost, it was noticeable, however, that only such plants as were bruised by drifting soil showed serious injury, ten degrees of frost having very little injurious effect on the unbruised plants.

The following varieties were exposed to the full force of the north-west storms of early June, and in consequence were seriously injured, hence the returns given of these cannot fairly be used in comparing the productiveness of varieties—Archer, White-eyed Marrowfat, White Wonder and Chancellor.

The four most productive sorts this year were all cross-bred varieties, which have been originated on the experimental farms.

The sample of pease was much finer this year than usual, the care exercised in selecting uniform seed each year has greatly improved many sorts.

All the varieties were sown on the 17th of April, the size of the plots was $\frac{1}{20}$ acre each, and the soil a clay loam, which had been summer fallowed; a hoe drill was used in seeding and from 2 to 2½ bushels of seed sown per acre.

PEASE—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Length of Pod.	Size of Pea.	Yield Per Acre.		Weight per Bushel.
			Inch's	Inch's		Bush.	Lbs.	Lbs.
King	Aug. 26	131	38	3	Large	42	40	62
Alma	" 26	131	34	3½	"	40	40	63½
Bedford	Sept. 6	142	28	2½	Medium	40		64
Trilby	Aug. 26	131	39	3½	Large	38	20	62
Mummy	" 25	130	24	2	Medium	37	40	62
Bright	Sept. 6	142	35	3	"	37	20	63½
Carleton	" 4	140	38	3	Small	36	40	64
Creeper	Aug. 26	131	30	2	"	36	40	63½
Archer	" 26	131	44	2½	Medium	36		64
Centennial	" 26	131	33	3½	Large	35	40	62
Victoria	" 30	135	36	3	"	35	20	64
Mackay	" 26	131	33	3½	"	35		63
Prussian Blue	" 26	131	42	3	Medium	35		63
White Wonder	" 18	123	24	2	"	34	40	64
New Potter	" 26	131	28	2	"	34	40	63
Kent	" 26	131	31	3½	Large	34		63
Golden Vine	" 20	125	30	2	Small	34		63½
Chancellor	" 10	115	32	2	"	34		63
Elephant Blue	" 20	125	34	3	Medium	34		62½
Crown	" 20	125	30	2	Small	33	40	63½
Prince	" 26	131	39	3½	Large	33	20	63
Prince Albert	Sept. 5	141	32	3	Small	32		63½
Agnes	Aug. 25	130	33	3	Medium	32		63½
Harrison's Glory	" 25	130	20	3	"	32		62
Pride	" 19	124	16	3	"	31	40	65
Canadian Beauty	" 26	131	36	3	"	30	20	63½
Black Eyed Marrowfat	" 26	131	33	3½	Large	29	20	64
Oddfellow	" 26	131	36	3	Medium	29	20	65
Arthur	" 20	125	30	......	"	29	20	62
Duke	Sept. 4	140	30	.....	Large	27		64
Nelson	Aug. 23	128	37	2½	Medium	26	40	64
Early Britain	" 20	125	27	3	"	26	40	61
Paragon	Sept. 6	142	30	3	"	26	40	63
Multiplier	" 2	138	42	2½	Small	26	20	63
Vincent	Aug. 25	130	33	3	Medium	26		63
Daniel O'Rourke	" 18	123	31	3	"	25	20	65
Macoun	Sept. 4	140	34	3	"	25		62½
Perth	Aug. 26	131	36	3	"	24	40	62
Large White Marrowfat	" 30	135	44	3½	Large	22	40	64
Bruce	Sept. 6	142	30	3½	"	21	20	63¼

EXPERIMENTS WITH INDIAN CORN.

The very light rainfall of the past season lessened the yield of fodder corn very materially, and the returns were considerably below the average.

The soil was a black loam ; all the varieties were sown on the 19th of May, and the yield per acre has been calculated from the weight of crop cut from two rows, each 66 feet long.

The long open fall was favourable for ripening, and matured ears could have been obtained from many varieties, but it was thought advisable to cut the fodder at the usual date, 28th August.

For the first time in our experiments, the yield from corn sown in hills exceeded that sown in drills. This is probably to be attributed to the hills being in a soil slightly more moist.

In addition to the test plots of fodder a field of 8 acres was planted for ensilage purposes, and a fair crop was harvested and cured for ensilage. As the corn in this field was in the late milk stage when cut, the ensilage will doubtless be fully up to the average in quality. The yield, however, is less than usual.

INDIAN CORN—Test of Varieties.

Name of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Early Milk.	Late Milk.	Condition when cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
	Inches.							Tons.	Lbs.	Tons.	Lbs.
Red Cob Ensilege	82	Very leafy	Aug. 20				In tassel	19	500	16	100
Wisconsin White Dent	73	"	" 7	Aug. 13	Aug. 21	Aug. 27	Late milk	18	1,400	14	1,700
Rural Thoroughbred White Flint	66	"	" 21	" 26			In silk	17	1,200	16	100
North Dakota Yellow Flint	60	"	" 7	" 13	Aug. 24		Early milk	17	1,200	11	
Longfellow	68	"	" 7	" 21	" 25		"	16	1,000	11	1,100
Giant Prolific Ensilage	79	"	" 10	" 24			In silk	15	800	13	400
Canada White Flint	72	Fairly leafy	" 6	" 14	Aug. 24		Early milk	15	800	10	900
Saltzer's North Dakota	65	Very leafy	" 8	" 13	" 21	Aug. 25	Late milk	15	800	11	
Kaffir Corn	52	"					Not in tassel	15	800	18	1,400
White Pearl Pop Corn	67	"	Aug. 25				In tassel	15	800	12	1,300
Sanford	64	Fairly leafy	" 13	Aug. 21	Aug. 25		Early milk	14	600	9	1,800
Extra Early Huron Dent	60	"	" 6	" 13	" 21	Aug. 25	Late milk	14	600	12	1,300
White Rice Pop Corn	78	"	" 6	" 14	" 21		Early milk	13	1,500	10	900
Champion White Pearl	73	Very leafy	" 7	" 13	" 21	Aug. 27	Late milk	13	400	19	1,600
Sweet Fodder Corn	52	Fairly leafy	" 5	" 12	" 21	" 25	"	13	400	9	700
Clouds Early Yellow	92	"	" 20	" 25			In silk	12	1,300	16	1,000
Mammoth 8-rowed flint	73	Very leafy	" 6	" 13	Aug. 21	Aug. 25	Late milk	12	200	16	1,000
King of the Earliest	69	"	" 8	" 13	" 21	" 25	"	12	200	14	600
Ninety-day Corn	74	Fairly leafy	" 12	" 21	" 25		Early milk	12	200	11	1,760
Early Butler	77	"	" 6	" 14	" 20		"	11	1,760	18	1,400
Compton's Early	66	"	" 7	" 13	" 20		"	11	1,100	14	1,700
Angel of Midnight	62	Very leafy	" 8	" 14	" 21		"	11	1,100	19	1,600
Selected Leaming	79	"	" 21	" 25			In Silk	11	1,100	13	400
New White Cap Yellow Dent	84	"	" 9	" 15	Aug. 20		Early milk	11		15	1,800
Pearce's Prolific	62	Fairly leafy	" 8	" 16	" 21	Aug. 25	Late milk	11		9	700
Cuban Giant	80	Very leafy	" 20	" 25			In silk	11		17	1,200
Amber Rice Pop Corn	62	Few leaves	" 8	" 15	Aug. 21	Aug. 25	Late milk	11		9	700
Wisconsin Yellow Dent	72	Fairly leafy	" 14	" 21	" 27		Early milk	11		9	700
Mitchell's Extra Early	42	"	" 1	" 6	" 10	Aug. 21	Late milk	8	1,600	13	400
Pride of the North	77	"	" 13	" 20	" 25		Early milk	8	500	11	
Kendalls Giant Corn	45	Few leaves	" 1	" 8	" 14	Aug. 23	Late milk	7	300	9	700

FIELD ROOTS.

The season has not been a favourable one for field roots, the rainfall being much too light for these moisture-loving plants.

The land for all kinds of field roots was prepared by spreading ten loads of well rotted manure per acre in the fall. The land was then ploughed at once eight inches deep, and well harrowed and rolled. In the spring the field was simply harrowed and the seed sown in flat drills, and kept clean during the growing season by means of a one-horse cultivator and hoeing.

EXPERIMENTS WITH TURNIPS.

Eighteen varieties of turnips were tested this year, sown at two different dates. The previous crop was mangels. They were quite free of injury from insect enemies, but the yield, owing to insufficient rainfall, was much below the average, although the quality was excellent. As usual, the early sown plots, with few exceptions, gave the largest returns. The purple top varieties continue to take the lead for productiveness.

The soil was a rich sandy loam; the estimate of yield has been made from the product of two rows, each 66 feet long. The roots are free of rot. The first plots were sown on the 20th May, the second on the 3rd June, in drills 30 inches apart; all were pulled on 1st October.

TURNIPS—Test of Varieties.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Hall's Westbury	11	1,232	387	12	8	1,952	299	12
Halewood's Bronze Top	11	440	374	..	8	1,424	290	24
Mammoth Clyde	10	328	338	48	6	1,200	220	
Shamrock Purple Top	9	1,800	330	..	8	1,424	290	24
Prize Purple Top	9	1,536	325	36	8	1,160	286	
Marquis of Lorne	9	1,008	316	48	6	1,992	233	12
East Lothian	9	480	308	..	8	1,688	294	48
Pearce's Prize Winner	9	216	303	36	10	856	347	36
Bangholm Selected	9	216	303	36	8	1,424	290	24
Carter's Elephant	8	1,952	299	12	7	520	242	
Skirving's	8	1,952	299	12	8	1,160	286	
Giant King	8	1,688	294	48	7	1,576	259	36
Jumbo or Monarch	8	1,424	290	24	8	632	277	12
Hartley's Bronze	8	896	281	36	8	1,952	299	12
Sutton's Champion	8	632	277	12	9	1,800	330	
Perfection Swede	7	1,576	259	36	9	744	312	24
Selected Champion	7	1,048	250	48	6	1,728	228	48
Selected Purple-Top Swede	4	712	145	12	11	440	374	

EXPERIMENTS WITH MANGELS.

The light rainfall of the past year has reduced the crop of mangels to one-half of last year's returns.

Eighteen varieties were sown, but the seed of three of these germinated badly, and the yield given is not a fair test of these varieties.

The first set of plots were sown on the 20th of May, the second on the 3rd of June, and the roots from both were pulled on 30th September.

They were sown after turnips, the soil was a rich sandy loam which was ploughed deeply in the fall, the seed was sown in flat drills 30 inches apart, and the yields per acre have been estimated from the product of two rows each 66 feet long.

MANGELS—Test of Varieties.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Champion Yellow Globe	26	8	866	48	15	96	501	36
Mammoth Long Red	25	424	840	24	15	1,944	532	24
Selected Mammoth Long Red	23	464	774	24	26	1,328	888	48
Giant Yellow Intermediate	22	352	739	12	16	1,000	550	
Canadian Giant	21	32	700	32	20	1,184	686	24
Norbitan Giant	20	1,976	699	36	23	1,256	787	36
Red Fleshed Globe	20	392	673	12	13	1,984	466	24
Giant Yellow Globe	19	808	646	48	15	1,944	532	24
Ward's Large oval shaped	18	1,488	624	48	19	1,336	655	36
Golden Tankard	17	584	576	24	14	1,832	497	12
Giant Yellow Half Long	15	1,944	532	24	18	112	585	12
Mammoth Long Red (Evans)	15	1,680	528	..	18	696	611	36
Warden Orange Globe	14	1,832	497	12	12	816	413	36
Gate Post	14	776	479	36	20	128	668	48
Golden Fleshed Tankard	13	400	440	..	11	1,760	396	
Red Fleshed Tankard	11	176	369	30	6	144	202	24
Large Oval Globe	10	856	347	36	12	1,344	347	36
Yellow Intermediate	6	672	211	12	17	56	567	36

EXPERIMENTS WITH CARROTS.

As usual carrots have suffered more from the light rainfall than any of the other field roots, and the yield of all varieties is much below the average.

Fifteen varieties of carrots have been under test this year. The soil was a rich sandy loam which had been deeply fall ploughed; the previous crop was turnips. The seed was sown in flat drills 18 inches apart at two different dates, the first plots on the 20th of May, the second on the 3rd of June, and all were pulled on the 30th September.

The yields per acre have been calculated from the product of two rows each 66 feet long.

CARROTS—Test of Varieties.

Name of Variety.	Yield per Acre.—1st Plot.		Yield per Acre.—1st Plot.		Yield per Acre.—2nd Plot.		Yield per Acre.—2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
White Green Top Orthe	4	360	139	20	3	600	110	
Mammoth Intermediate	3	600	110		3	1,480	124	40
Giant White Vosges	3	600	110		5	1,440	190	40
Iverson's Champion	3	600	110		5	1,000	183	20
White Belgian	2	1,720	95	20	3	160	102	40
Early Gem	2	840	80	40	3	1,480	124	40
Half Long White	2	840	80	40	4	1,240	154	
Yellow Intermediate	2	400	73	20	3	1,920	132	
Half Long Chantenay	2	400	73	20	2	400	73	20
Long Orange or Surrey	1	1,520	58	40	3	160	102	40
Scarlet Intermediate	1	1,520	58	40	3	1,920	132	
Improved Short White	1	1,080	51	20	3	160	102	40
Guerande or Ox Heart	1	640	44		2	400	73	20
Carter's Orange Giant	1	640	44		2	1,280	88	
Long Scarlet Altringham		1,760	29	20	3	160	102	40

EXPERIMENTS WITH SUGAR BEETS.

The following are the yields obtained from five varieties of sugar beets, sown at two different dates on rich black loam treated in the same manner as mangels.

The first plots were sown on the 20th of May, and the second on 3rd June.

All were pulled on the 30th September, and the yield per acre has been calculated from the produce of one row 66 feet long.

SUGAR BEETS—Test of Varieties.

Name of Variety.	Yield per Acre.—1st Plot.		Yield per Acre.—1st Plot.		Yield per Acre.—2nd Plot.		Yield per Acre.—2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Red Top Sugar	20	1,184	686	24	16	1,792	563	12
Vilmorin's Improved	20	656	677	36	10	1,120	352	
Improved Imperial	15	1,680	528	.	13	1,192	453	12
Danish Improved	13	928	448	48	20	392	673	12
Wanzleben	11	176	369	36	13	1,720	462	

EXPERIMENTS WITH POTATOES.

The yield of potatoes was not only lessened by the unusually light rainfall, but from some unknown cause many varieties germinated badly.

The land selected was in barley last year, and was deeply ploughed in early spring. It was again ploughed shallow on 21st of May, and the tubers cut in pieces, with two or three eyes each, were planted in every third furrow.

The field was kept clean of weeds during the growing season by the use of harrows and cultivator.

There were no rotten potatoes and very few scabby ones.

All the varieties were planted on the 21st May, in black loam soil, without manure, and were dug 29th September.

The yield per acre has been estimated in each case from the product of one row, 66 feet long.

The following varieties germinated badly and the returns given from them should not be considered a fair test of their productiveness: Pearce's Prize Winner, Lee's Favourite, Good News, Early White Prize, Honeoye Rose, Orphan's, Beauty of Hebron, Albany No. 1, Daisy, Lightning Express, Early Ohio and I.X.L.

POTATOES—Test of Varieties.

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Yield per Acre. Total. Bush.	Total. Lbs.	Marketable. Bush.	Marketable. Lbs.	Unmarketable. Bush.	Unmarketable. Lbs.	Form and Colour.
New Variety No. 1..	Rank.....	Sept. 9..	Med. to large	Fair....	363	..	341	..	22	..	Flat, white.
Reeve's Rose........	"	" 9..	Sm'll to med.	Very dry..	341	..	333	40	7	20	Round, red.
Seedling No. 7 B.C..	Very rank	" 9..	Med. to large	Wet......	322	40	322	40	...	..	Long, flat, deep red.
Reading Giant	Fair......	" 9..	Medium....	Dry......	315	20	293	20	22	..	Round oval, pink and white.
Flemish Beauty Seedling	Rank	" 12..	....	"	304	20	275	..	29	20	Long, red.
E. J. Hunter.......	"	" 9..	Med. to large	"	300	40	300	40	...	..	Long, round, red.
Clarke's No. 1......	"	" 9..	Medium....	"	289	40	282	20	7	20	" pink.
General Gordon.....	Fair......	" 13..	Med. to large	"	264	..	245	40	18	20	" red.
Everett.	"	" 9..	" ..	"	260	20	260	20	...	..	" light red.
Great Divide.....	"	" 9..	Sm'll to med.	Wet......	256	40	242	..	14	40	" white.
Lizzie's Pride.......	"	" 9..	Med. to large	Dry.....	256	40	256	40	...	..	Flat oval, lt. red.
Late Puritan.......	Rank	" 9..	....	Fair......	253	..	238	20	14	40	Long, red.
Pride of the Market.	"	" 9..	Med. to large	Dry.....	253	..	253	..	...	..	Wht. kidney.
Hale's Champion....	Fair......	" 13..	Sm'll to med.	"	249	20	231	..	18	20	Flat, round, wht.
Brown's Rot Proof..	Very rank	" 9..	" ..	Fair.....	249	20	238	20	11	..	Round oval, red.
King of the Roses. .	Fair......	" 3..	Medium....	Dry......	245	40	245	40	...	..	Oval, light red.
Dreer's Standard ...	Rank	" 9..	"	Fair......	242	..	238	20	3	40	Long, round, wht
Chicago Market.....	Fair......	" 13..	Med. to large	Dry......	238	20	220	..	18	20	Flat oval, light yellow.
Houlton Rose.... ..	"	" 9..	" .	Fair......	238	20	238	20	...	..	Long, round, lt. pink.
Irish Cobbler.......	Weak....	" 13..	" ..	Dry......	231	..	231	..	...	..	Flat, round, wht.
Hopeful	Rank	" 9..	" ..	Fair....	223	40	223	40	...	..	Long, flat, white.
Seedling No. 7.....	Very rank	" 9..	" ..	Damp....	220	..	220	..	...	..	Round oval, deep pink.
Lady Frances......	Rank ...	" 9..	Sm'll to med.	Fair......	216	20	179	40	36	40	Oval white.
McKenzie	"	" 9..	" ..	Choice....	216	20	198	..	18	20	Long, round, wht.
American Wonder..	"	" 9..	Med. to large	Wet......	212	40	205	20	7	20	Large, oval "
Money Maker	Fair......	" 9..	Sm'll to med.	Dry......	209	..	179	40	29	20	" round "
State of Maine......	Very rank	" 9..	" ..	Fair......	209	..	198	..	11	..	" flat "
Russell's Seedling...	Rank	" 9..	Med. to large	Dry......	205	20	187	..	18	20	Round oval "
Delaware...........	Fair......	" 9..	" ..	Damp....	201	40	201	40	...	..	Long flat "
Forty Fold.........	Rank ...	" 9..	Sm'll to med.	....	201	40	154	..	47	40	Round, blue.
Quaker City	Very rank	" 9..	Med. to large	Fair......	201	40	201	40	...	..	Flat oval, white.
Carman No. 1......	Rank	" 9..	Sm'll to med.	Wet......	201	40	201	40	...	..	Long, round "
Seattle	"	" 9..	Medium .	Dry.....	201	40	190	40	11	..	" "
Charles Downing....	Fair......	" 9..	Med. to large	"	198	..	198	..	...	..	Flat oval "
Early Rose.........	Fair......	" 13..	" ..	Dry......	198	..	198	..	...	...	Oval, pink.
Burpee's Extra Early	Weak	" 5..	" ..	Fair......	198	..	183	20	14	40	"
Sharpe's Seedling....	" ...	" 5..	" ..	Dry......	198	..	198	..	...	...	"
Empire State......	Very rank	" 9..	Medium....	Wet......	194	20	194	20	...	..	Round, white.
Early Gem....	Weak....	" 10..	"	Dry.. ...	194	20	172	20	22	..	Oval, red.
Green Mountain . .	Rank	" 9..	Med. to sm'll	"	194	20	190	40	3	40	Long, white.
Munroe Country....	Fair......	" 9..	" to large	Choice....	194	20	194	20	...	..	" red.
Troy Seedling.	"	" 9..	Sma. to med.	Wet......	190	40	157	40	33	..	" white.
Wonder of the World	"	" 5..	Med. to large	Dry......	190	40	190	40	...	..	Oval, red.
Uncle Sam..........	"	" 9..	Sma. to med.	Wet......	190	40	190	40	...	...	Long, white.
Northern Spy.......	"	" 9..	Med. to large	Dry......	187	..	176	..	11	..	" deep red.

POTATOES—Test of Varieties—*Continued.*

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Yield per acre. Total. Bush.	Lbs.	Marketable. Bush.	Lbs.	Unmarketable. Bush.	Lbs.	Form and Colour.
Satisfaction (Suttons)	Rank	Sept. 9..	Sma. to med.	Wet......	187	..	161	20	25	40	Round, lig. y'l'w.
S. E. Bill..........	Fair....	" 9..	" ..	Fair......	183	20	110	..	73	20	" blu. wh'e.
Seedling No. 230....	"	" 13..	" ..	Choice....	183	20	183	20	..	..	" white.
Queen of the Valley.	Very rank	" 9..	Large......	Dry......	183	20	183	20	..	..	Long, pink.
Early Six Weeks....	Weak....	" 10 .	Med. to large	"	183	20	168	40	14	40	Round, "
Dakota Red.........	Rank	" 9..	Large......	Wet......	183	20	183	20	..	..	Long, red.
Crown Jewel........	Weak....	" 10..	Med. to large	Dry......	179	40	161	20	18	20	Round, light red.
Earliest of All....	"	" 3..	" ..	"	179	40	176	..	3	40	Oval, "
Ideal...........	Rank	" 9..	Large......	Fair......	179	40	179	40	..	..	Long, red.
White Beauty.....	Fair.....	" 13.	Med. to large	Dry.....	179	40	179	40	..	..	" white.
Early Norther	"	" 5..	" ..	Fair......	176	..	176	..	..	..	" pink.
Satisfaction	Rank	" 12..	Medium....	Dry.....	176	..	157	40	18	20	" white.
Vanier.............	"	" 9..	Med. to small	"	176	..	168	40	7	20	" pink.
World's Fair........	Fair.....	" 9..	Med. to large	"	176	..	176	..	..	..	Flat, white.
Early Harvest	Weak....	" 10..	" ..	Choice....	172	20	172	20	..	..	Long, "
Early Puritan.......	Fair.....	" 9..	Sma. to med.	Wet......	172	20	165	..	7	20	" "
Good News.........	....	" 9..	Med. to large	Fair......	168	40	168	40	..	..	Long, round, pink
Pride of the Table...	Fair.....	" 9..	" ..	Dry......	168	40	157	40	11	..	Flat, oval, "
Brownell's Winner..	Rank	" 9..	" ..	Fair......	168	40	168	40	..	..	" red.
Duke of York......	....	" 9..	" ..	"	165	..	165	..	..	..	" yellow.
Victor Rose.........	Fair.....	" 9..	" ..	Wet......	165	..	161	20	3	40	Long, flat, red.
Columbus.........	Rank	" 9..	Sma. to med.	Dry......	165	..	146	40	18	20	" round, "
Burnaby Seedling...	Fair.....	" 9..	Large to med	Fair......	161	20	161	20	..	..	" " "
Peerless Junior......	Rank.....	" 9..	Small to med	Fair......	161	20	154	..	7	20	Round, white.
Rough Red.........	Fair......	" 9..	" ..	"	161	20	88	..	73	20	" pink.
Grampions.........	"	" 9..	" ..	Wet......	157	40	135	40	22	..	" "
Irish Daisy.........	"	" 9..	" ..	Dry......	157	40	157	40	..	..	"
Polaris.............	Weak....	" 9..	Med. to large	"	154	..	150	20	3	40	" pink.
Rochester Rose.....	Fair.. ...	" 9..	" ..	"	154	..	154	..	..	..	Long "
Maule's Thoroughb'd	"	" 9..	" ..	Wet......	154	..	150	20	3	40	" "
Jennie Deans.......	Rank.....	" 9..	Small......	Dry......	150	20	143	..	7	20	Round, white.
Early Sunrise.	Weak....	" 5..	Med. to large	Fair......	146	40	124	40	22	..	" oval, pink.
Pearce's Extra Early	"	" 10..	" ..	Dry......	146	40	139	20	7	20	Oval, lt. red.
Rural Blush........	Rank.....	" 9..	Small to med	"	146	40	146	40	..	..	" red.
Seedling 214.......	Very weak	" 13..	" ..	Fair......	146	40	146	40	..	..	" white.
American Giant.....	Fair......	" 9..	Medium ..	"	143	..	132	..	11	..	White.
Algoma No. 1.......	Very weak	" 1..	Med. to large	Dry.....	139	20	132	..	7	20	Oval, pink.
Thorburn.	Fair......	" 13..	" ..	"	139	20	139	20	..	..	" "
Princess May.......	"	" 13..	Small. ..	Fair.....	135	40	102	40	33	..	" "
"Bill Nye"........	"	" 9..	Small to med	Wet......	132	..	132	..	..	..	Long r'nd, white.
Early White Prize..	Weak....	" 5..	Med. to large	Fair......	124	40	124	40	..	..	Oval, lt. yellow.
Fill-basket..........	Fair......	" 9..	" ..	Dry......	124	40	124	40	..	..	Long, deep pink.
London.............	Weak....	" 5..	" ..	"	124	40	124	40	..	..	Flat, oval, red.
Rose No. 9..........	Rank.....	" 9..	" ..	Fair......	121	..	113	40	7	20	" " "
Snowdrop..........	Fair......	" 9..	Small to med	Dry......	113	40	95	20	18	20	" " white.
Harbinger.........	"	" 10..	" ..	"	113	40	99	..	14	40	" pink.
Sir Walter Raleigh..	"	" 9..	" ..	.. ....	110	..	110	..	..	..	" white.
New Queen.........	Weak....	" 10..	Large....	Fair......	110	..	102	40	7	20	Long r'nd, pink.
Freeman...........	Fair......	" 10..	Small to med	Wet......	110	..	110	..	..	..	Flat oval, white.
Abundance (Sutton's No. 6)...........	Rank.....	" 9..	Small......	.. ....	110	..	58	40	51	20	White.
Maggie Murphy....	"	" 9..	Med. to large	Dry......	106	20	106	20	..	..	Long flat, lt. red.
Stourbridge Glory...	"	" 9..	Small.....	Wet......	102	40	47	40	55	..	White.
I. X. L.	Fair......	" 9..	Med. to large	Fair......	102	40	102	40	..	..	Long round, red.
Her Majesty........	Rank.....	" 9.	Small ...	....	99	..	51	20	47	40	
Beauty of Hebron...	Weak....	" 10..	Med. to large	Dry......	95	20	95	20	..	..	Long oval, red.
Rural New Yorker, No. 2.	Fair.....	" 9..	Small to med	Wet......	91	40	55	..	36	40	Round flat, white
Carman No. 3.......	"	" 9..	" ..	Fair......	88	..	51	20	36	40	Long flat, lt. yel'w
Clay Rose	Rank.....	" 9..	Med. to large	Wet......	88	..	51	20	36	40	Long flat, red.
Lee's Favourite.....	Very weak	" 10..	" "	Dry......	88	..	80	40	7	20	Oval, light red.
Record.........	Rank.....	" 9..	Small....	Fair......	88	..	7	20	80	40	White.
Bovee..............	Weak.....	" 5..	Med. to large	Choice....	78	20	71	..	7	20	Oval light red.

POTATOES—Test of Varieties—*Concluded.*

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Yield per Acre. Total.		Marketable.		Unmarketable.		Form and Colour.
					Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Holborn Abundance.	Fair	Sept. 9..	Sm'll to med.	Wet......	73	20	36	40	36	40	Round, white.
Early Ohio..........	Weak.....	" 1..	Med. to large	Choice....	73	20	73	20	..	..	" light rose.
Vick's Extra Early..	Fair	" 9..	Sm'll to med.	Fair......	71	..	71	..	..	..	" " yellow
Ohio Junior.........	Very weak	" 1..	Med. to large	Dry......	71	..	71	..	..	..	" " pink.
Prize Taker.........	Fair	" 9..	" "	Fair......	71	..	71	..	..	..	" deep red.
Orphans........	"	" 9..	Small	Wet......	66	..	36	40	29	20	White.
Daisy.	Very weak	" 10..	Medium....	Dry......	51	20	51	20	..	..	Round oval, red.
Lightning Express..	....	" 9..	Large	"	44	..	44	..	..	..	Long flat, pink.
Turner's Hall Seedling No. 5...... ..	Rank.....	" 9..	Small	Wet......	44	..	..	..	44	..	
Pearce's Prize Winner	....	" 9..	Med. to large	Dry.	36	40	36	40	..	..	Flat oval, white.
Honeoye Rose.......	....	" 9..	" "	Fair......	22	..	22	.	..	..	Oval, light pink.
Albany No. 1.......	....	" 9..	Small	Wet......	18	20	18	20	..	..	Kidney.
Table King..........	Fair	" 9..	Sm'll to med.	Dry.	14	40	14	40	..	..	Round, white.

EXPERIMENTS WITH FLAX.

The series of experiments with flax begun in 1896, were continued during the past season, the yield of straw is heavier this year but the return of seed is less.

The soil was a rich clay loam summer-fallowed, size of plots $\frac{1}{20}$ acre. One half of each plot was pulled as soon as the seed pods had turned brown, the other half was left until the seed had ripened, when it was cut and threshed in the usual way.

Variety.	Amount of Seed sown per acre.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Date when Pulled for Fibre.	Weight of Straw when pulled for Fibre, per Acre.	Yield per Acre.		Weight per Bushel.	Weight of Straw when cut per Acre.
	Lbs.				Inch.		Lbs.	Bush.	Lbs.	Lbs.	Lbs.
Flax.....	40	May 26..	Aug. 27..	93	30	Aug. 17..	2,600	9	36	56	3,180
"	80	" 26..	" 27..	93	25	" 17..	3,700	11	44	56	3,320
"	40	June 2..	" 31..	90	29	" 25..	3,300	11	24	56	2,660
"	80	" 2..	" 31..	90	29	" 25..	3,900	14	16	56	2,560
"	40	" 9..	Sept. 3..	86	29	Sept. 1..	3,500	12	28	56	2,100
"	80	" 9..	" 3..	86	29	" 1..	3,800	12	48	56	2,280
"	40	" 16..	" 6..	82	28	" 5..	3,540	10	20	56	2,720
"	80	" 16..	" 6..	82	28	" 5..	2,040	11	44	56	2,140

The plots sown on the 2nd of June gave the best return of seed, the sowings of the 9th June the largest quantity of straw. In every instance the thicker sowing gave the largest return of seed per acre and with one exception the largest quantity of straw also.

EXPERIMENTS WITH GRASSES AND CLOVERS.

Owing to the rapidly increasing herds of cattle and the lessening natural pasturage in Manitoba, the interest in grasses and fodder plants is increasing each year. For this reason special attention has been paid to this branch of experimental work, and during the past season about one hundred plots, varying in size from $\frac{1}{40}$ acre each to 6 acres, have been devoted to grasses and clovers with gratifying success.

The objects in view when undertaking this work were :—

1st. To ascertain the hardiness and suitability for this country of the different varieties tested.

2nd. To compare results from sowing grass seed with and without a crop of grain.

3rd. To ascertain the most suitable quantities of seed for sowing.

4th. To see whether a crop of clover, sufficiently heavy to benefit the soil as a green manure, could be grown either in one or two years.

5th. To gain information regarding the most suitable mixtures of grasses for hay and permanent pasture.

The summer of 1896 was an exceptionally favourable season for grasses, and all the varieties were in good condition by fall ; the snow came early and remained until the following spring, making an excellent covering during the severe months of winter.

The following plots of grass were one-tenth acre in size and the clovers one-twentieth acre each. The field was in barley during 1895 and the stubble was ploughed in the spring of 1896. The seed was sown broadcast on all the plots on the 8th of May, 1896, and at once harrowed in. Weeds were mowed twice during 1896, but none of the plots produced sufficient grass in that year to pay for cutting.

The soil was a medium sandy loam.

GRASSES—Test of Varieties.

Variety.	Seed per Acre.	Height on 15th May.	Height of Aftermath.	Thickness of Aftermath.	Yield per Acre.	
	Lbs.	In.	In.		Tons.	Lbs.
Western Rye Grass (Agropyrum tenerum)..........	20	6	8	Thin	3	750
Awnless Brome Grass (Bromus inermis)............	20	10	10	Very thick...	3	400
American Rye Grass (Elymus americanus)......	20	6	8	Thin	2	510
Bald Rye or Wheat Grass (Elymus Virginicus)	20	7	4	Poor...........	2	200
Fall Meadow Oat Grass (Avena elatior).......	30	8	11	Fair	1	400
Meadow Foxtail (Alopecurus pratensis)..............	20	7	12	Germinated badly.	1	200
Hard Fescue (Festuca duriuscula)	20	4	6	" "	1	200
Timothy (Phleum pratense)...............	15	4	9	Thin.............	1	200
Orchard Grass (Dactylis glomerata)......	25	5	10	Very thick........	1	50
Red Top (Agrostis vulgaris)........................	20	7	8	Fair..............	1	
Timothy, ...mixed	10	4	10	"	}	750
Common Clover........................... "	10	4	12	"		

GRASSES—Thin, Medium and Thick Sowing.

Variety.	Seed per Acre.	Apparent Thickness on 6th July.	Height when cut.	Yield per Acre.	
	Lbs.		In.	Tons.	Lbs.
Timothy (Phleum pratense)	5	Rather thin	27	1	600
" "	10	Right thickness	27	1	670
" "	15	Too thick	27	1	750
" "	20	"	27	1	700
Awnless Brome Grass (Bromus inermis)	10	Thin	28	2	350
" " "	15	Right thickness	28	2	
" " "	20	Too thick	28	2	400
Western Rye Grass (Agropyrum tenerum)	10	Too thin	27	3	400
" " "	15	Right thickness	27	3	200
" " "	20	Too thick	27	3	300
Bald Rye or Wheat Grass (Elymus Virginicus)	10	Too thin	26	2	700
" " "	15	Right thickness	26	2	700
" " "	20	Too thick	26	2	750
American Rye Grass (Elymus americanus)	10	Too thin	32	3	
" " "	15	Right thickness	32	3	555
" " "	20	Too thick	32	3	500

GRASSES—Mixtures for Hay and Pasture.

No.	Variety.	Seed of each Variety.	Total seed per Acre.	Appearance 6th July.	Aftermath.	Yield per Acre.	
		Lbs.	Lbs.			Tons.	Lbs.
1	Western Rye Grass	10	15	Principally Western Rye Grass	Poor	2	800
	Canadian Blue	5					
2	Alfalfa Clover	20	40	" Alfalfa Clover	"	2	400
	Western Rye Grass	20					
3	White Dutch Clover	5	20	" Timothy	Fair	2	200
	Kentucky Blue Grass	10					
	Timothy	5					
4	Hard Fescue	5	25	" Timothy and Fescue	"	1	900
	Sheep "	5					
	Canadian Blue	5					
	Timothy	5					
	Red Top	5					
5	Canadian Blue	5	15	" Timothy	"	1	600
	Timothy	10					
6	Canadian Blue	10	20	" Timothy	"	1	400
	Timothy	10					
7	Awnless Brome Grass	10	20	" Awnless Brome	Good	1	200
	Canadian Blue	10					

CLOVERS—Test of Varieties.

Variety.	Seed per Acre.	Height on 15th May.	Aftermath Height.	Aftermath Thickness.	Yield per Acre.		Remarks.
	Lbs.	Inch's	Inch's		Tons.	Lbs.	
Bokhara	10	4	32	Fair	14	..	Very woody.
Alfalfa	60	6	15	"	2	100	Promising.
Mammoth Red	25	4	8	"	1	500	"
Alsike	10	3	4	"	1	100	Too short for hay.
Red Clover	20	4	15	Thick	..	900	Injured by drought.
White Dutch	12	2	....	....	not cut....		Only fit for pasture.

SUMMARY.

1st. In a favourable season, that is when the snow comes early and remains all winter; many of the hardier varieties of grasses and clovers will winter successfully in this climate,

2nd. Western Rye Grass (a native of our prairies) again takes the lead for yield of hay, the quality is also excellent but Awnless Brome Grass gives nearly as much hay and better aftermath, the pasture in spring is also earlier.

3rd. The yield of hay for the first year is not materially influenced by the amount of seed used above a certain quantity, but thick seeding is expected to lessen the yield during the second and following years.

4th. Western Rye Grass and Canadian Blue gave the largest yield of any mixtures tested but the aftermath is light for the first year, but may improve in a year or two when the Blue Grass gets established.

5th. Clover sown without a nurse crop can be depended upon for a green manure in a favourable season, but it is doubtful whether it will prove a success if sown with a grain crop.

GRASS SEED DISTRIBUTION.

There has been a very much larger demand for samples of grass seed during the past season than in any former year; fortunately the crop on the Experimental Farm was larger than usual. Seventeen hundred and fifty-one pound bags were sent out in the free distribution, and forty-two lots of about fifteen pounds each were sold.

MILLETS.

Five varieties of millets were tested during the past season, they were all sown on summer fallow in drills 7 inches apart.

Some of the plots suffered more than others from the severe winds of May, and for that reason the experiment as a comparative test of varieties can not be considered conclusive.

Hungarian Grass has generally given the best results on this farm, and it was one of the most productive this year.

Size of plots one-twentieth of an acre, soil rich black loam; all were sown on 27th May.

Name of Variety.	When Sown.	Size of Plot.	When Headed.	Kind of Head.	Height of Straw.	Yield per Acre.	
		Acre.			Inch.	Tons.	Lbs.
Japanese	May 27	$\frac{1}{20}$	....	Not headed	32	4	1,000
Hungarian	" 27	$\frac{1}{20}$	Aug. 20	Round	33	3	1,800
Golden Wonder	" 27	$\frac{1}{20}$	" 15	"	30	3	800
New Manitoba	" 27	$\frac{1}{20}$	" 1	Branching	44	2	....
New Siberian	" 27	$\frac{1}{20}$	" 20	Round	31	1	1,800
Golden Millet	" 27	$\frac{1}{20}$	" 11	"	30	1	....
*Holy Terror	.....	.....	.....	.....	.....	.....	.....

* Destroyed by wind, &c.

CATTLE.

The herd of cattle on this farm now consists of 20 head; all have been perfectly healthy during the year.

Since the outbreak of tuberculosis in 1894 all animals have been tested with tuberculin before being admitted into the regular cattle buildings. The whole herd has been tested again this fall, and none of the animals have reacted.

The following is a list of the names, breed, age and weight of the animals:—

Name of Animal.	Breed.	Age.	Weight.
			Lbs.
Qu'Appelle Red Knight, bull	Shorthorn	4 years	2,165
Brandon Fashion, cow	"	4 "	1,265
Rideau Chief, bull	Ayrshire	4 "	1,570
Dandy, cow	"	8 "	1,200
Brandon Jock, bull calf	"	9 months	430
Princess Leda 2nd, cow	Holstein	8 years	1,545
Manitoba Prince, bull	"	4 "	2,170
Leda of Brandon, cow	"	3 "	1,235
Leda's Princess of Brandon, heifer	"	18 months	1,000
Brandon Monk, bull calf	"	10 "	785
Lady Jane Grey, cow	Grade	9 years	1,220
Topsy, cow	"	5 "	1,115
Daisy, cow	"	9 "	1,300
Pansy, cow	"	3 "	1,140
Fanny Fern, cow	"	2 "	1,135
Violet, heifer	"	21 months	875
Jennie, heifer	"	19 "	920
Black Prince, steer calf	"	2 years	1,290
Barney, steer calf	"	6 months	540
Spotty, steer calf	"	2 "	170

EXPERIMENTS IN FEEDING STEERS.

The exports of steers from this province have been much larger this year than during any previous year in the history of the province, but I regret that a large proportion were stockers sold probably at from fifty to seventy-five per cent less money than they would bring if stall fed and shipped to Great Britain; if it pays the Ameri-

cans to purchase these stockers for fattening with the addition of a heavy import duty it would certainly pay our farmers to fatten them here.

In 1895 a test was made on this farm of the feeding value of native hay cut in the unbroken meadows, as compared with oat sheaves; this year native hay made from wheat grass (Elymus virginicus) but grown on cultivated land was fed in comparison with oat sheaves. For this purpose eight shorthorn grade steers two years old were purchased in December at $2\frac{1}{2}$ cents per pound live weight and sold in May at 4 cents.

The steers were divided into two evenly matched groups of four each and fed all they would eat clean of the following ration.

First lot of four steers.

	Pounds.
Native hay cut (Elymus virginicus)	18
Turnips cut	30
Barley chopped	5
Oats "	2

Second lot of four steers.

	Pounds.
Oats sheaves cut (Banner)	18
Turnips cut	30
Barley chopped	5
Oats "	2

The actual amount and estimated value of the feed consumed during the feeding period of 93 days was as follows :—

First lot of four steers.

5,976 pounds native hay at $5 per ton	$14 94
128 bushels turnips at 5 cents per bushel	6 40
1,758 pounds barley chop at ½ cent per pound	8 79
700 pounds oats chop at ½ cent per pound	3 50
	$33 63

Second lot of four steers.

6,416 pounds oat sheaves at $5 per ton	$16 04
133 bushels turnips at 5 cents per bushel	6 65
1,840 pounds barley chop at ½ cent per pound	9 20
728 pounds oat chop at ½ cent per pound	3 64
	$35 53

Summary of Results.	First cost of Steers.	Value of Feed consumed.	Price sold for.	Profit per lot.	Daily gain of each Steer.
	$ c.	$ c.	$ c.	$ c.	Lbs. Oz.
First lot of four steers with hay	109 75	33 63	198 80	55 42	1 8
Second lot of four steers with oat sheaves	110 50	35 53	196 40	50 37	1 5

From the above it would appear that the cultivated native hay is worth rather more per ton than oat sheaves, for fattening purposes.

The yield of hay from this grass varies greatly from year to year, depending on the rainfall, but it averages somewhat less than the yield of oat sheaves, under the same conditions.

This grass succeeds remarkably well on dry uplands where an oat crop would give small returns; its roots are also very useful in preventing the drifting of soil.

EXPERIMENTS FOR THE PURPOSE OF MAINTAINING THE FLOW OF MILK DURING THE AUTUMN MONTHS.

Last year's report contained the particulars of an experiment with Awnless Brome Grass for the above purpose. During the past season the experiment was repeated with equally satisfactory results, and an additional test with fodder corn was undertaken.

Four cows were selected for this test, and, after several weeks of uniform feeding to ascertain the normal yield of milk, two were fed for three weeks commencing on fair native pasture, and the other two on the same pasture, with the average addition of 755 pounds of green fodder corn per week for the two.

The following table gives the details of the experiment.

First Week Aug. 22nd to 28th or Normal Yield.

How Fed.	Yield of Milk.
No. 1. Pasture alone	317 lbs.
No. 2. do	241 lbs.

Second Week.

How Fed.	Yield of Milk.	Gain over Normal.
No. 1. Pasture and 665 lbs. corn	343 lbs.	26 lbs. gain.
No. 2. Pasture alone	226 "	15 " loss.

Third Week.

How Fed.	Yield of Milk.	
No. 1. Pasture and 750 lbs. corn	330 lbs.	13 lbs. gain.
No. 2. Pasture alone	231 "	10 " loss.

Fourth Week.

How Fed.	Yield of Milk.	
No. 1. Pasture and 850 lbs. corn	319 lbs.	2 lbs. gain.
No. 2. Pasture alone	209 "	32 " loss.

Summary.

No. 1. Two cows with corn and pasture average weekly gain over normal 13 pounds.

No. 2. Two cows with pasture alone weekly loss below normal 19 pounds.

From the above it will be seen that the yield of milk from the two fed on pasture decreased at the average rate of 19 pounds per week while the two cows receiving the additional feed of corn made an average gain of 13 pounds per week for the three weeks, showing that this useful fodder plant can be utilized for the purpose of maintaining the flow of milk until severe frost, when the cows can be turned into Brome Grass aftermath; which is not affected by even severe frosts.

Brome Grass pasture in comparison with native grass pasture during the autumn months.

For this test the same cows were used as in the experiment just mentioned, but in this case the No. 1 group of two cows were fed on native pasture while the No. 2 group were kept on Brome Grass pasture.

The large gain made by the first two cows during the second week was no doubt owing to their having a somewhat larger range of pasture than before, the change evidently being a decided benefit at first.

The results given in the following table indicate the great value of the Awnless Brome Grass for this purpose.

First Week, Sept. 12th to 18th.

	How fed.	Yield of Milk.
No. 1.	Pasture and 850 lbs. green corn	319 lbs.
No. 2.	Pasture alone	209 "

Second Week.

	How fed.	Yield of Milk.	Gain over first week.
No. 1.	Native pasture	424 lbs.	105 lbs. gain.
No. 2.	Brome Grass	431 "	222 " "

Third Week.

No. 1.	Native pasture	230 lbs.	89 lbs. loss.
No. 2.	Brome Grass	227 "	18 " gain.

Fourth Week.

No. 1.	Native pasture	194 lbs.	125 lbs. loss.
No. 2.	Brome Grass	202 "	7 " "

Summary.

No. 1. Group. Native pasture lost a weekly average of 36 pounds of milk.
No. 2. " Brome Grass made a weekly average gain of 77 pounds of milk.

SWINE.

The herd of swine on the farm consists of :—

Name.	Breed.	Age.
Chrissie, sow	Berkshire	2 years.
Sir Richard, boar	"	1 "
Amber Belle, sow	Tamworth	2 "
Barrow (not named)	"	1 "
Dunrobin, boar	"	6 months.
Squire, boar	Chester, white	6 "

As it was impossible to procure young pigs for experimental purposes at a suitable time, no experiments were made with these animals during the year.

POULTRY.

The breeds of poultry kept on the farm during the past year consisted of White and Barred Plymouth Rocks and Black Minorcas. All were perfectly healthy and there has been no recurrence of the sore throat so troublesome last year.

As a thorough trial of the Barred Plymouth Rocks has been made during former years, it was thought advisable to discontinue keeping this breed and a change has been made to White Plymouth Rocks, for that reason no record of eggs has been kept during the year.

About sixty chickens about equally divided between White Plymouth Rock and Black Minorcas have been raised this summer without any loss whatever from sickness.

The White Plymouth Rock Cockerels being quite promising as table fowl their fitness for this purpose has been tested. A number of turkeys were also procured for the same purpose.

FATTENING POULTRY.

The importation into this province of dressed fowls reaches large dimensions each year, it is estimated that twenty thousand turkeys alone were imported into Winnipeg last season. This represents a large sum of money, all of which should be retained in the province. In addition the demand for dressed fowl in many other districts is large and increasing, much of which could be supplied from here.

Recognizing the importance of this subject, some attention has been paid during the past season to the fattening of poultry. Ten turkeys, five male and five female, hatched on a neighbouring farm in May, were purchased. Five of these were penned up and fed with a mixture composed of 50 per cent wheat, 25 per cent oats and 25 per cent barley. The ration was fed chopped and wet with milk in the morning and the whole grain fed for the evening meal.

The five running at large were allowed to gather the bulk of their food in the fields, only a very small quantity of grain being given them morning and evening to attract them to the roost.

The five penned birds were given all they would eat up clean twice a day.

In addition to the ten turkeys ten cockerels were selected for the same purpose, six of them being White Plymouth Rocks and four Black Minorcas. These were fed with the same kind of food and in the same manner as the turkeys.

The penned fowl both turkeys and chickens were, when dressed, much plumper and in every way more inviting than those which had been running at large, but the close confinement and heavy feeding appears to injure the chickens otherwise, the White Plymouth Rocks being badly "off their feet," while those running at large were quite healthy and active.

The turkeys were apparently more fond of oats than either barley or wheat, and towards the latter portion of the fattening period the proportion of this grain was increased with benefit.

RESULTS WITH TURKEYS.

		Lbs.	Oz.
Oct. 14.	Weight of 5 birds in pen	32	12
Nov. 25.	" "	53	00
	Gain	20	04

Amount of grain consumed 120 pounds, or 6 pounds of grain to 1 pound of increase.

		Lbs.	Oz.
Oct. 14.	Weight of 5 birds running at large	32	12
Nov. 25.	" " "	42	00
	Gain	9	04

CHICKENS.

	Lbs.	Oz.
Sept. 28. Weight of 3 White Plymouth Rock Cockerels in pen	12	02
Nov. 26. " " " "	21	07
Gain	9	05

	Lbs.	Oz.
Sept. 28. Weight of 3 White Plymouth Rock Cockerels at large	11	11
Nov. 26. " " " "	17	13
Gain	6	02

	Lbs.	Oz.
Sept. 28. Weight of 2 Black Minorca Cockerels in pens	8	05
Nov. 26. " " " "	10	02
Gain	1	13

	Lbs.	Oz.
Sept. 28. Weight of 2 Black Minorca Cockerels at large	7	04
Nov. 26. " " " "	10	05
Gain	3	01

Total amount of grain consumed by the 5 penned chickens 3 White Plymouth Rocks and 2 Black Minorcas was 57 pounds.

GAIN IN PERIODS.

	Lbs.	Oz.
5 turkeys penned, gained first three weeks	13	6
5 " " second "	6	14
3 White Plymouth Rock penned, gained first three weeks	5	5
3 " " at large "	2	11
3 " " penned, gained 2nd period of two weeks	2	7
3 " " at large " "	1	6
3 " " penned " 3rd period of three weeks	1	9
3 " " at large " "	2	1

Shrinkage between live and dressed weight.

5 turkeys penned, lost	25 per cent.
5 " at large "	30 "
3 White Plymouth Rocks penned, lost	34 "
3 " at large "	33 "
2 Black Minorcas penned "	34 "
2 " at large "	34 "

SUMMARY.

1st. The 5 penned turkeys gained in the 24 days 11 pounds more than the 5 running at large.

2nd. The 3 penned White Plymouth Rock Cockerels gained in the 59 days 3 pounds 3 ounces more than the 3 running at large.

3rd. The 2 penned Black Minorcas made a gain for the first two weeks over those running at large, but for the whole 59 days the birds running loose gained the most by 1 pound 4 ounces.

4th. Both turkeys and chickens made the largest increase during the first three weeks.

5th. After 6 weeks of close confinement chickens are probably kept at a loss.

6th. White Plymouth Rock chickens are better adapted for feeding in small pens than Black Minorcas.

7th. The White Plymouth Rocks were a better colour and more attractive when dressed than the Black Minorcas.

8th. Penned turkeys shrunk 5 per cent less in dressing than those running at large.

9th. Chickens whether penned or running at large lost practically the same in dressing, viz., 34 per cent.

Our climate is suitable, feed is abundant and there is no reason why this province should not be a large exporter rather than an importer of dressed fowl.

EXPERIMENTS WITH BEES.

WINTERING.

As mentioned in last year's annual report five hives of Italian Bees were placed in the cellar of one of the dwellings on the farm on 10th October, 1896, the room containing bees was the one usually devoted to vegetables and was separated by a wooden partition from the furnace, ventilation was given by means of a chimney opening in the cellar, the temperature during the winter as ascertained by a self registering thermometer remained steady between 40 and 50 degrees Fah.

The hives were placed six inches from the floor and protected with a piece of old woollen carpet placed under the wooden cover; when placed in the cellar each colony had 30 pounds honey which proved more than sufficient for the winter and all the hives wintered successfully.

They were placed on the summer stands on 30th April and commenced to work at once on native willows.

One hive was forwarded to the Indian Head Experimental Farm and the other four were worked through the season for extracted honey.

TO PREVENT EXCESSIVE SWARMING.

As some difficulty was experienced in 1896 with persistent swarming and a resulting weakness of the colonies, special efforts were made to prevent this by giving plenty of room; on 6th July most of the brood frames were filled with bees and a very large upper story 14 x 20 and 15 inches deep filled with wired foundations and without a queen excluder was added, and the frames extracted as required, this gave an abundance of room and no swarming whatever occurred and all the colonies became very strong before fall.

An average of forty-five pounds of extracted honey was taken from each hive which was readily sold at 10c. per pound wholesale.

BEES.

Following is a list of plants, trees and shrubs, on the flowers of which the bees were seen working during the summer, together with dates when first noticed. Gum Weed (Grindelia squarrosa), a native plant, apparently yielding the largest amount of honey :—

Date.	Botanical Name.	Common Name.
May 1	Salix discolor	Native Willow.
" 12	Amelanchier alnifolia	Saskatoon.
" 12	Prunus Americana	Native Plum.
" 15	Negundo aceroides	Ash Leaf Maple.
" 20	Caragana arborescens	Siberian Pea Tree.
" 22	Prunus Pensylvanica	Pin Cherry.
" 25	Ribes rubrum, etc.	Red Currants.
" 26	Ribes aureum	Yellow Flowering Currant.
" 26	Caragana pendula	Weeping Pea Tree.
" 27	Caragana mollis glabra	Woolly Pea Tree.
June 1	Asparagus officinalis	Garden Asparagus.
" 1	Syringa Josikea	Josika's Lilac.
" 1	Prunus pumila	Ground Cherry.
" 1	Lonicera splendens	Honeysuckle.
" 3	Populus tremuloides	Aspen-leaved Poplar.
" 5	Lonicera gracilis	Graceful Honeysuckle.
" 9	Lonicera Tatarica	Tartarian "
" 12	Rheum hybridum	Rhubarb.
" 22	Rosa blanda	Native Rose.
" 23	Rubus	Raspberry.
" 25	Vicia villosa	Winter Vetch.
" 25	Trifolium repens	White Dutch Clover.
" 26	Syringa villosa	Downy Lilac.
" 30	Allium cepa	Garden Onion.
July 4	Sinapis alba	White Mustard.
" 6	Dianthus caryophyllus	Pinks.
" 6	Trifolium hybridum	Alsike Clover.
" 9	Melilotus alba	Bokhara Clover.
" 10	Reseda odorata	Mignonette.
" 15	Spiraea salicifolia	Willow-leaved Meadow Sweet.
" 17	Trifolium pratense	Common Clover.
" 18	Satureja hortensis	Summer Savory.
" 20	Papaver (all types)	Garden Poppies.
" 20	Rosa rugosa	Japan Rose.
" 28	Grindelia squarrosa	Gum Weed.
" 30	Borago officinalis	Borage.
" 30	Cucumis sativus	Cucumber.
" 31	Tropæolum minor	Dwarf Nasturtium.
Aug. 4	Raphanus sativus	Radish.
" 4	Linum perenne	Blue Flax.
" 11	Ænothera biennis	Evening Primrose
" 12	Cucurbita Pepo	Squash.
" 12	Helianthus giganteus	Wild Sunflower.
" 13	Antirrhinum majus nanum	Snapdragon.
" 14	Salpiglossis variabilis	Beauty of Bolivia.
" 14	Solidago rigida	Golden Rod.
....	" Canadensis	"
....	" Missouriensis, and others	"
Aug. 14	Liatris	
" 14	Epilobium angustifolium	Great Willow Herb.
" 14	Aster Lindleyanus, and others	Native Asters.
" 19	Verbena hybrida	Garden Verbenas.
" 19	Helichrysum monstrosum	Everlasting Flower.
" 19	Zinnia elegans	Garden Zinnia.
" 19	Dahlias	Garden Flower.
" 19	Phlox Drummondii	Drummond's Phlox.
" 19	Hollyhocks	Garden Flower.
" 19	Mentha Canadensis	Wild Mint.
" 19	Monarda fistulosa	Wild Bergamot.
" 19	Portulaca grandiflora	Garden Portulaca.
" 20	Gaillardia Lorenziana	Double Gaillardia.

From the experience gained in keeping bees for ten seasons in this country, I see no difficulty in keeping them in Manitoba with profit. Bees can be wintered in any fairly dry cellar if sufficiently warm to keep vegetables from freezing, and sufficient plants giving honey can be found near all well watered or wooded sections. The honey obtained from native plants is excellent in quality, and sufficiently plentiful to make the business both pleasant and profitable.

EXPERIMENTS WITH APPLES.

Although a very large number of so-called hardy varieties of apples have been tested here and all have been found too tender for this climate, we still think it is advisable to give any very promising kinds a trial.

Four standard apple trees—two Tonka and two Wealthy—were received from Mr. A. P. Stevenson, Nelson, Manitoba, in the spring of 1896. These were grafts of trees that have become acclimatized at the low altitude in which Nelson is situated, namely, 900 feet above sea level. They have so far proven hardy, and we trust that coming from this source, they may succeed even at this altitude—1,231 feet.

PYRUS BACCATA—WILD CRAB OF SIBERIA.

Specimens of this tree were sent here from the Central Experimental Farm at Ottawa in 1890, and they have proved perfectly hardy; additional varieties from the same source have been added from time to time, until at this date we have a very promising collection; the oldest trees, which are Pyrus Baccata-aurantiaca, produce a fair amount of fruit each season, and are found to be most useful for the making of jelly, the fruit being rich in pectin.

The number of trees in this block were increased last year by 100 very fine seedlings —25 Pyrus Prunifolia and 75 Pyrus Baccata Yellow. These were raised at the Central Experimental Farm, Ottawa, from selected seed, and many of them are expected to produce larger fruit than the varieties already fruited here.

The Yellow Siberian crab apple seedlings give great promise of future usefulness, 48 of which were raised from seed in 1893 are now vigorous trees, and, although growing in the open valley, have successfully stood the severity of four winters.

Many seedlings of the Transcendent Crab have been raised here this season from Manitoba grown seed, the fruit having been raised by Mr. A. P. Stevenson, of Nelson. These will be carefully transplanted in the spring, and we think that with trees from this source greater success may be had.

PLUMS.

In the spring of 1896, 72 trees of 36 varieties of improved native kinds were received from Charles Luedloff, Carver, Minnesota. Having been grown so near to Manitoba, it was hoped that these would all prove hardy here. They were all root grafts and the hardiest sorts have made a fine growth, and have wintered well while others have been killed to the ground by frost and are at present growing from below the graft. A list is given below with notes on their present condition.

PLUMS—Test of Varieties.

Name of Variety.	Number planted.	Number alive.	Number dead.	Remarks.
New Ulm	2	2	.....	Healthy growth.
De Soto	2	2	.....	
Clinton	2	2	.....	Killed to ground, growing below graft.
Deep Creek	2	2	.....	" " " "
Neill's	2	2	.....	Slightly killed, healthy growth. "
Van Buren	2	2	.....	Half hardy "
Easter	2	2	.....	Killed to snow line.
Missouri Apricot	2	2	.....	" "
Gaylord	2	2	.....	Slightly killed back.
Ocheeda	2	2	.....	Killed to near ground.
Silas Wilson	2	2	.....	Slightly winter-killed.
Irene	2	1	1	Killed to ground.
Weaver	2	2	.....	Apparently hardy.
American Eagle	2	2	.....	Killed to snow line.
Forest Rose	2	2	.....	" near ground.
Emerson	2	2	.....	" "
Hammer	2	2	.....	" "
Illinois Ironclad	2	2	.....	" "
Chas. Downing	2	2	.....	" "
Van Deman	2	2	.....	Slightly killed back.
Crescent City	2	1	1	Killed to snow line.
Wood	2	2	.....	Slightly killed back.
Large Red Sweet	2	1	1	Killed to snow line.
Speer	2	1	1	Apparently hardy.
Dunlop Nut	2	2	.....	" "
Colorado Queen	2	2	.....	Killed to snow line.
Peffer's Premium	2	2	.....	Apparently hardy, some bloom.
Cheney	2	2	.....	" " "
Purple Yosemite	2	2	.....	" " "
Cottrell	2	2	.....	Apparently hardy.
Milton	2	2	.....	Killed to snow line.
Yellow Sweet	2	2	.....	Apparently hardy.
City	2	2	.....	Killed to snow line.
Col. Wilder	2	2	.....	" "
Richland	2	2	.....	Slightly killed back.
Dr. Dennis	2	2	.....	Killed back half.

The seedlings of Weaver, De Soto, Cheney, Voronesh 102, and Speer sent from the Central Farm which have now been growing here for three years, came through last winter in good condition, many of them blossoming for the first time, but owing to late spring frosts the fruit did not form.

A large consignment of seedlings of Cheney, Hungarian, Yosemite Yellow, Voronesh, Ida, Rollingston, Weaver, De Soto, Van Buren, Wolf, Yosemite Purple, Speer and American were received from the Central Experimental Farm, Ottawa, this spring. They arrived here in good condition and specimens of all were planted in permanent orchards.

The remainder were planted in nursery rows where they will be available for distribution for test in other parts of the province. With few exceptions they have become established and made healthy growth.

The native Manitoba plum, however is the variety on which our hopes are chiefly centered as a hardy sort for this province, and some of them transplanted from the river banks have already fruited here.

Many thousand trees have been raised from seeds of selected fruit from different parts of this province, and when these arrive at the fruiting stage, the work of selecting the best will be most interesting. Scions have been taken from the more promising types of those that have already borne fruit so that propagation by grafting may be accomplished.

CHERRIES.

With regard to the above fruit some attention has been given of late to the improvement of one of the native cherries, known as the Sand Cherry, *Prunus pumila.* Three varieties of wild cherries grow here, the pin cherry (Prunus Pennsylvanica), a verry small red cherry, very acid but which makes a good jelly. The choke cherry (P. Virginiana) somewhat larger but astringent and bitter. These latter do not appear to vary in character and hence much improvement by selection cannot be looked for. With the Sand Cherry, however, the variation is remarkable, almost every bush showing some distinct characteristics in size or quality from the small useless bitter sort scarcely eatable to a large pleasant eating cherry with very little astringency or bitterness. Several varieties of extra promise have been named and are being propagated as rapidly as possible.

In 1895 there were sent from the Central Experimental Farm 5 seedlings each of the following cultivated varieties: Bessarabian, Olivet; Montmorency, Carnation; Red Morella, and Wragg. These were planted under shelter of a thick hedge.

The seedlings of the first three named have so far proved hardy and grow from the tips each spring, seedlings of Carnation freeze back slightly each year and those from Wragg and Red Morella winter kill to near the ground.

RASPBERRIES.

The past season has more than ever shown the desirability of protecting raspberries during winter. Those lifted from their winter covering on 5th May were in splendid condition alive to the tips while a block of bushes which was purposely left unprotected was killed back to half the length of the canes.

The yield of fruit this year did not reach the average. All the varieties set a fair quantity and a large yield was expected, but prolonged dry weather in July followed as it invariably is by red spider greatly lessened the yield, but in the latter part of the season copious showers exterminated the red spider and revived the plants, so that a fair amount of late fruit was gathered. The new canes also made a vigorous growth and have been laid down this winter in fine condition.

Following is a list of new varieties which have become established, but have not yet fruited :—

Miller,	Palmer,	Kenyons Seedling,
London,	Kansas,	Gregg.
Parnell,	Niagara,	Heebner.
		Garfield.

Two varieties of blackberries, Agawam and Snyder, also are thus far promising as to hardiness.

CURRANTS.

This season currants of all kinds were more or less adversely affected by protracted spring frosts and dry weather, but notwithstanding this a very fair crop was harvested, and much valuable data was gathered respecting the frost and drought resisting capabilities of the many varieties undergoing test.

With the varieties of black currants previously reported on the Climax one of the new seedlings from the Central Farm and the Prince of Wales gave the best results. The Lee's Prolific and Black Champion (the standard varieties hitherto) are hard to

beat for a favourable season, but they have not the frost and drought resisting powers of some of the newer kinds, especially the two above mentioned.

With the Red Currants, Red Grape gave the best results; this variety and the Raby Castle can be confidently recommended. They are vigorous growers and produce large crops of fine flavoured fruit.

With the White Currants the White Grape has not yet been superseded.

The following varieties fruited here for the first time this season:—

Variety.	Flavour.	Colour.	Size.	Earliness.	Productiveness.	Growth.
Ethel	Good	Black	Large	Late	Good	Vigorous.
Charmer	Acid	"	Small	Early	Poor	Not thrifty.
Perry	Poor	"	"	Medium	"	Fairly healthy.
Monarch	Very good	"	Large	Late	Good	Vigorous.
Standard	Good	"	Medium	Early	"	Very vigorous.
Climax	Excellent	"	Large	Very early	Very good	Very healthy.
Eagle	Woody	"	Small	Late	Poor	Fairly "
Ontario	Sweet	"	"	Medium	Fair	Healthy.
Beauty	Excellent	"	Very large	Late	Good	Vigorous.
Clipper	Sour	"	Medium	Early	Fair	"
Winona	Very good	"	Large	Late	Good	Very healthy.
Sterling	Sweet	"	Small	Early	Fair	Fairly "
Parker	Acid	"	Medium	"	Poor	Vigorous.

GOOSEBERRIES.

Six each of ten new varieties of gooseberries were received this spring. They arrived in good condition and most of them have made fine healthy growth. They will be reported on more fully when they have fruited here.

The five Manitoba sand hill gooseberries mentioned on page 355 of last year's report, have been increased largely by cuttings. Specimens will be planted in pemanent positions next season, we hope this may prove a valuable addition to the list of Manitoba fruits.

NOTES ON THE ARBORETUM.

This plantation of trees and shrubs improves in appearence every year and each season some objects of beauty are added.

The whole of the Arboretum was sown with grass seed in the fall of 1896, and has this year formed a fairly good sod; this adds greatly to the beauty of the appearance of the plantation. Circles sufficiently large to allow of root developement have been cut in the grass around each specimen, and the surface soil is kept cultivated and free from weeds so as to give favourable conditions for further growth and developement.

There is now in this plantation a succession of bloom during the growing season which makes this part of the farm most interesting and attractive.

Following are notes taken of some of the ornamental shrubs in this block in continuation of the list given on page 363 of last year's report.

BUFFALO BERRY (*Sheperdia argentea*).—A native shrub, useful as well as ornamental. The flowers are inconspicuous and the shrubs diœcious, that is, the male flowers are produced on one specimen and the female flowers on another. The pistillate trees bear a

red acid fruit, useful for jellies. Shrubs nine years old are now ten feet high and five feet in spread of branches; flowers early in May.

ALBERT HONEYSUCKLE (*Lonicera Alberti*).—This beautiful floriferous shrub is worthy of all praise, but is not well enough known. Its pendulous branches, with its striped-leaved foliage and clusters of showy violet flowers of pleasing perfume, make it unique and very desirable. Height, 2 feet 6 inches; in full bloom on 4th June; readily propagated by layers or cuttings.

COMMON BARBERRY (*Berberis vulgaris*).—This is not thoroughly hardy, but is apparently becoming more so each year. Seed was gathered from it in 1896 and sown last spring, and many vigorous young seedlings are the result. It is expected that this second generation will withstand our winters. In bloom 7th June; pretty wax-like yellow flowers, succeeded by bright red berries in drooping clusters. They are acid and are said to be useful for jelly. One bush, nine years planted, is now five feet high; may be increased either by cuttings or seed.

RUSSIAN SOUTHERNWOOD (*Artemisia abrotanum Tobolskianum*) is an importation from Siberia. Its maximum height is about seven feet, and serves a very useful purpose where a rapid growing wind-break and snow collector is wanted on the open and often bleak prairies as a shelter for more valuable and less hardy trees. Cuttings seldom fail to strike. Too much stress cannot be placed on the necessity of clipping at least twice in the growing season; for, if allowed to ripen, their seed (which are produced on a terminal spike) they will scatter and grow and may become a nuisance. This shrub is recommended for hedges on high bleak plains.

OLD MAN (*Artemisia abrotanum*) is an English form of the above; has a much sweeter scent; it only attains the height of 1½ to 2 feet; useful for a lawn or flower garden.

PURPLE CYTISUS (*Cytisus purpurea*).—A delicate free blooming little shrub, which, with slight winter protection, has proved hardy. In bloom 5th June; produces pretty pea-shaped purple flowers; grows readily from seed.

NATIVE HONEYSUCKLE (*Lonicera glauca var. Sulivanti*) is in flower on 25th June; a pretty, trumpet flowered, woody twiner, with rich, red, sweet-scented blossoms; they are found native in the shady ravines and bluffs of the country; should be grown in shade of a wall.

VIRGINIAN CREEPER (*Ampelopsis quinquefolia*).—This is indigenous to Manitoba, and is an ornamental climber of much merit, which thrives well and is perfectly hardy. This, when well rooted, soon covers a house with its rich foliage; is propagated quickly by cuttings. The flowers are inconspicuous.

WHITE VIRGIN'S BOWER (*Clematis flammula*).—Another pretty climber, which is very showy when in bloom, and is a desirable acquisition for the verandah or trellis. In full bloom in August. The roots of this clematis are hardy, but the stem dies back each year to the ground. It makes a rapid growth during the summer.

NEW FOREST TREES AND ORNAMENTAL SHRUBS.

The consignment of trees received from the Central Experimental Farm, Ottawa, in 1896, have now been tested for one winter and two summers.

Many of them have proven hardy and will increase the collection of hardy varieties materially. The more tender ones will be useful as specimens, the roots in many cases being perennial and the shoots making each season a good growth.

The Elders and Clematis coming under this category, after they have had the test of another winter, fuller particulars will be given regarding their hardiness and usefulness for this climate.

FOREST TREE SHELTER BELT.

Notwithstanding the dry season the forest tree shelter belt has made good progress, the trees having made a small but healthy growth. This belt has now become very dense, and with the accumulation of the leaves of several years' growth, to act as a natural mulch, the evaporation is reduced to a minimum.

Work in keeping down weeds by cultivation has been unnecessary in this block for the last two years, and it is now kept up without expense, except for occasional thinning.

In continuation of last year's report, descriptions are given of some of the most useful trees in this belt with average heights and spread of branches in the following notes:

Green Ash (Fraxinus viridis).—This is a native tree and grows readily from seed. It is not, however, a popular tree on account of the lateness of leafing in the spring and its slow growth.

Measurement of an average 9-year old tree was 2½ inches in diameter, 1 foot from the ground, and 10 feet high, the wood is valuable both for fuel and manufacturing purposes.

Balm of Gilead (Populus balsamifera).—This native tree is deserving of praise, it is a rapid grower attaining a large size and although the wood is not specially useful for lumber it makes fair firewood and is a desirable shade tree. An average tree (9 years old) measures 16 feet high, 12 feet spread of branches with a trunk 4 inches in diameter, 1 foot from the ground.

Native Aspen (Populus tremuloides).—This tree is found common in all parts of this province. The prairie fires are its greatest enemy; in tracts of country protected from fire for a few years, little bluffs grow up in profusion. It is the wood used almost exclusively for fuel in Manitoba and is excellent for that purpose, it is not specially desirable as a shade tree.

The measurements of a 9-year old tree are as follows:—16 feet high with 5 feet spread of branches and a trunk 4 inches in diameter at the base. This poplar can be propagated from cuttings.

Mossy-cup Oak (Quercus macrocarpa).—This is the native scrub oak. The maximum height of this tree is about 40 feet.

Its knarled trunk and brittle wood reduces its value for manufacturing purposes, but it is much valued a fuel. It is a very slow grower, average specimens grown from seed were measured at 8 years old and were 3 feet high with a trunk 1½ inches in diameter. Propagation is not difficult from the acorn.

White Willow (Salix Alba).—This was sent from the Central Farm in 1890. It has done remarkably well here, grows naturally in tree form to a large size. Its capability to withstand a bleak exposure makes it highly desirable for general culture. Height 20 feet, spread of branches 13 feet, diameter of trunk 6 inches, tree measured was 8 years old.

American Larch (Larix Americana).—This is indigenous to the province and is much sought after for fuel. It seems to thrive equally well on the upland prairie as in the lower valley lands, although it is usually found in the swamps in the vicinity of the sand hills, where young seedlings can be procured in abundance. A specimen planted 8 years ago now measures 10 feet high, 4 feet in spread of branches, with a trunk 4 inches in diameter 1 foot from the ground.

HEDGES.

The use and beauty of a well trimmed hedge is becoming more and more acknowledged each season, also the value of untrimmed or partially trimmed hedge inclosures for shelter, and many inquiries are made as to the varieties of trees and shrubs best adapted for these purposes.

As we now have growing on the farm many sample hedges of 50 feet each or more in length and several miles of hedge inclosures of various kinds planted in different ways we are able to give from experience some information on this question.

Test hedges to afford shelter for large inclosures were planted in 1890 at different distances apart in double and single rows to gain information as to the best method. So far our experience leads us to prefer the single rows, planted 18 inches apart.

Two year old trees should be used, those if kept clipped back for a year or two to encourage a good bottom growth make a very dense and attractive hedge.

The white spruce, cottonwood, ash-leaved maple, bereolensis poplar and sharp-leaved willow hedges planted in 1890 have made very fine growth and are much admired by the visiting public.

Appended is a list of hedges with date of planting and other particulars.

Name of Variety.	When planted.	Remarks.
Green Ash (Fraxinus viridis)	1890	A slow growing hedge; coming into leaf late in season.
Hawthorn (Cratægus coccinea var Sullivanti)	1897	Very slow growing.
White Spruce (Picea alba)	1893	One of the best hedge trees for this province.
Yellow Flowering Currant (Ribes aureum)	1897	Ornamental; not dense.
Ash-leaved Maple (Acer negundo)	1890	A splendid wind-break; loses its leaves early in the fall; readily grown.
Spiræa Opulifolia	1894	Ornamental; a good collector of snow.
" " aurea	1894	" " "
Native Aspen (Populus tremuloides)	1894	Fair wind-break; difficult to transplant.
Choke Cherry (Prunus pennslyvanica)	1894	Ornamental; a good shelter hedge.
Hazel Nut (Corylus Americana)	1894	Not a good hedge, too open.
Saskatoon (Amelanchier alnifolia)	1894	So far not promising.
Native Rose (Rosa Blanda)	1894	A pretty low dense hedge for ornamental purposes.
Native Meadow Sweet (Spiræa salicifolia)	1894	A beautiful little two-foot hedge useful for flower garden.
Snowberry (Symphoricarpus racemosus)	1894	A low ornamental hedge; suckers badly.
Bush Honeysuckle (Lonicera tatarica)	1897	A good wind-break and ornamental.
Cotoneaster vulgaris	1897	Hardy and ornamental.
Siberian Pea Tree (Caragana arborescens)	1893	A most useful and ornamental wind-break.
Red-leaved Rose (Rosa rubrifolia)	1897	A quick grower; suitable for lawn.
Yellow Willow (Salix aurea)	1894	Ornamental in winter; a fine snow collector and wind-break.
Wild Plum (Prunus Americana)	1897	A promising hedge.
French Laurel Willow (Salix)	1897	Liable to sun-scald.
European " (Salix laurifolia)	1897	Much admired; a useful wind-break.
Cottonwood (Populus monilifera)	1890	An attractive, fast-growing hedge.
Siberian Southernwood (Artemisia abrotanum var Tobolskianum)	1895	The quickest growing hedge; if kept clipped is almost evergreen.
Rosemary-leaved Willow (Salix rosmarinifolia)	1897	Not sufficiently tested.
Salix Britzensis	1896	Makes a fair wind-break.
Caragana Mollis glabra	1895	A low hedge; useful for lawn.
Breaking buckthorn (Rhamnus frangula)	1897	Ornamental.
Asiatic Maple (Acer ginnala)	1893	A low hedge; very pretty in fall, turning to a deep crimson.
American White Elm (Ulmus Americanus)	1891	A good wind-break; dense hedge.
Wolf Willow (Eleagnus argentea)	1894	A low hedge, with pretty silvery foliage; suckers badly.
Red Osier Dogwood (Cornus stolonifera)	1894	A native; makes a useful and ornamental hedge.
Common Lilac (Syringa vulgaris)	1894	A good hedge plant for ornament or shelter.
Old Man (Artemisia abrotanum)	1893	A low, sweet-scented, ornamental hedge easily propagated.
Populus Bereolensis	1890	A very fine hedge; suitable for high ground; retains its leaves late in the season.

SPRAYING FOR INSECT PESTS.

We have had an unusual visitation during the past season from insects of the Aphis family, this may probably be attributed to the climatic conditions of the season, different forms of these plant lice have attacked the Maples, Willows, Currants and other shrubs and trees. The pest was kept in subjection by the use of refuse tobacco soaked in water and the liquid applied with a spray pump ; 6 pounds of tobacco was steeped for 6 hours in boiling water, then diluted with 25 gallons of water ; each large maple tree required 1¼ gallon of the liquid at each spraying, from one to two sprayings each season was found sufficient.

NOTES ON TREE SEEDS.

Last fall many tree seeds such as plums, crab-apples and cherries were saved and were placed in boxes with alternate layers of sand. These were placed in a position where they were exposed to the action of frost and were found to be in excellent condition for planting in the spring, most of the hard shell pits having burst. These were sown as soon as the ground was in condition and some thousands of flourishing young seedlings are the result.

The advantage of sowing tree seeds on summer-fallow was well demonstrated this season. Two plots of Caragana seed being sown on 25th April. Plot one was summer-fallow, Plot 2 was spring ploughing, harrowed and rolled the same day as it was ploughed.

On the 18th May the seeds in Plot No. 1 had germinated and were well out of their seed leaf stage ; on the other hand not one plant could be found in Plot No. 2 ; in fact they did not germinate until after heavy showers in the late summer. After the growing season trees on both plots were counted and measured, there were 25 per cent more plants on the summer-fallow and they were one foot higher and more vigorous.

FOREST TREE DISTRIBUTON.

Number of packages, trees distributed	906
" reports received	81
" received in good condition	74
" " in fair condition	2
" " in poor condition	5
" had good success	71
" had fair success	10
" failures	0

MAPLE SEED DISTRIBUTION.

Number of packages sent	385
" reports received	99
" very successful	58
" fairly successful	30
" failures	11

EXTRACTS FROM A FEW OF THE REPORTS ON FOREST TREE DISTRIBUTION, 1896.

Henry Smith, Chumah.—All made good growth, willows especially.

John M. Scott, Winnipeg.—All received from you made good growth.

D. D. Buchanan, Winnipeg.—Have distributed cuttings from plants sent me in 1895.

Rev. G. C. Hill, Boissevain.—All shrubs have grown splendidly.

A. Lawrence, Miami.—Received in first-class condition and have made good growth.

A. Laughlin, Cartwright.—Received in good condition. Had been put up with much greater care than some received from nurseries.

Wm. Allison, Burnbank.—Received in good condition, all I got are alive.

H. B. Perris, Fort Rouge.—Willows have made remarkable growth. Others nearly as good.

J. W. Irwin, Emerson.—Received in good condition, all plants lived.

Charles Cannon, Belmont.—Received in excellent condition. All growing but 3.

E. Pitman, Shrubland.—All did well, especially elm.

Wm. Hood, Sidney.—Received in good condition. All growing.

D. W. McDiarmid, Winnipeg.—I think there is no question, that the shrubs and trees coming from you, have given the best general satisfaction.

THE VEGETABLE GARDEN.

The past season was in many respects unfavourable for the successful production of vegetables. The spring opened propitiously, the garden being ready for the seed-drill about the middle of April, and we anticipated a long growing season. As soon as the seedlings were above ground, however, we experienced high winds, which, carrying the soil with them, seriously cut the young plants, and left them an easy prey to the severe frosts in May and early June. Several varieties had to be re-sown, including carrots, beans, turnips and radishes, which threw those vegetables back considerably. We were partially compensated by the open fall, which allowed many varieties to attain maturity, which otherwise would not have done so, and the late crops, such as cabbage, cauliflower, beets, turnips, &c., were fully up to their usual standard of excellence. Following will be found a summary of the work done in this department, the main portion of which was devoted to testing as fully as possible the following; pease, beans and squash.

PEASE.

Sixty varieties of this vegetable were sown, and all germinated with two exceptions, viz., "Anticipation" and "Laxton's Prolific Long Pod." During the early part of the season they suffered severely from drought, high winds and frost, being repeatedly cut back by the latter, and it appeared for a time that re-sowing would become imperative. On the approach of better weather, however, they rallied, and beyond being later than usual, in maturing, gave no cause for complaint, the yield and flavour being fully up to the average. All varieties ripened their seed, and enough of each was saved for samples, which will make an interesting addition to our sample-room. Following will be found arranged in tabular form the result of this test, together with a few notes on the more meritorious varieties. Sown with drill in rows 3 feet apart on 29th April.

PEASE.

Name of Variety.	Ready.	Ratio of Productiveness.	No. of Pease in Pod.	Length of Pod.	Length of Vine.	Character of Pea.
				Inches.	Inches.	
Philadelphia	July 8	7	5—6	2¼	24	Smooth.
French Canner	" 16	8	8—9	3⅛	30	"
American Wonder	" 17	8	5—6	2½	9	Wrinkled.
Blue Peter	" 18	12	4—5	2½	12	"
Ferry's First and Best	" 5	7	5—6	2¼	28	Smooth.
McLean's Little Gem	" 17	7	6—7	2¾	14	Wrinkled.
Long Island Mammoth	" 14	8	7—8	3¾	48	"
Hair's Dwarf Mammoth	" 30	11	7—8	3	24	"
Blue Beauty	" 8	9	6—7	2½	18	Smooth.
Horsford's Market Garden	" 20	10	9—10	4	24	Wrinkled.
Burpee's Profusion	" 24	15	6—7	3	24	"
John Bull	Aug. 1	12	8—9	4¼	24	"
Station	July 14	16	6—7	2½	14	"
Scorcher	" 1	6	4—5	2	18	Smooth.
Maud S	" 5	3	4—5	2	16	"
Exonion	" 12	10	5—6	2½	24	Wrinkled.
Rural New Yorker	" 7	8	5—6	2¼	22	Smooth.
Improved Alpha	" 16	7	4—5	2¼	14	Wrinkled.
Tom Thumb	" 12	12	6—7	2½	17	Round.
Lightning	" 8	6	4—5	2¼	28	Smooth.
Alaska	" 10	5	4—5	2	14	"
Admiral	" 18	5	7—8	2½	36	Wrinkled.
Chelsea	" 8	10	5—6	3	12	"
Carter's First Crop	" 12	10	5—6	2¼	15	Smooth.
Extra Early Tom Thumb	" 10	5	6—7	2¼	8	Round.
Kentish Invicta	" 14	7	6—7	2½	30	Smooth.
Wm. Hurst	" 14	9	5—6	2¾	10	Wrinkléd.
Premium Gem	" 10	8	5—6	2½	12	"
Heroine	" 26	10	9—10	4⅛	26	"
Rennie's New Queen	" 24	12	8—9	4¼	30	"
Improved Forty-Fold	" 20	15	7—8	3¼	48	"
Stanley	" 22	10	8—9	4	24	"
Abundance	" 20	10	6—7	2½	18	"
Nott's Excelsior	" 12	8	5—6	2½	9	"
Pride of the Market	" 20	8	8—9	3½	18	Smooth.
Dr. McLean	" 24	9	8—9	3¾	24	Wrinkled.
Daisy	" 23	9	8—9	3¾	18	"
Bliss' Everbearing	" 22	11	5—6	3	24	"
McLean's Advancer	" 20	12	6—7	2¾	24	"
Juno	" 26	10	7—8	4	24	"
Improved Stratagem	" 21	9	7—8	4¼	18	"
Telephone	" 19	10	6—7	4	36	"
Improved Fillbasket	" 21	10	8—9	4	26	Smooth.
Large White Marrowfat	" 20.—	13	6—7	3¾	48	"
Paragon	" 24	8	6—7	3¾	24	Wrinkled.
Black Eyed Marrowfat	" 22	15	7—8	3⅛	48	Smooth.
Duke of Albany	" 18	10	7—8	4	36	Wrinkled.
Laxton's Supreme	" 21	10	7—8	3¾	36	Smooth
Telegraph	" 23	10	7—8	4	36	Wrinkled.
Sander's Marrow	" 24	12	8—9	4¼	18	"
Champion of England	" 22	13	7—8	3¾	48	"
Duke of York	" 22	8	9—10	4	36	"
Shropshire Hero	" 26	10	7—8	4	16	"
New Victory	" 26	12	7—8	4	36	"
Melting Sugar	" 14	12	7—8	4	36	Smooth.
Tall Scimitar	" 16	12	7—8	4	36	"
Crossbred, N. Q. 5	" 20	10	6—7	3	12	Wrinkled.
Crossbred N. A. 5	" 8	10	6—7	3	12	"

The following varieties are worthy of special mention :—

Chelsea.—Extra long pods, well filled with pease of fine flavour, and very productive for an early variety. Certainly an improvement on American Wonder, being earlier, more productive and of just as good flavour as that variety.

Wm. Hurst.—An early variety, of excellent flavour and very productive. This should rank as a first-class early pea.

French Canner.—A very productive variety, and, as its name implies, is a typical canner. The pods are long and gracefully formed and well filled. A fine sort for the market gardener.

Improved Forty-Fold.—One of the best main crop pease tested. Very productive and of excellent flavour.

Sander's Marrow.—The finest flavoured pea grown this season. Individual pease exceptionally large and sweet. A high class variety.

BEANS.

Forty-seven varieties of beans were sown on 20th May, and all germinated well. On the morning of June 4th the thermometer registered several degrees of frost, and in consequence this sowing was completely eradicated. A second sowing was made on 7th June, and, as in some instances all the seed had been sown on the first occasion, the list of available varieties was reduced to 43. Notwithstanding this drawback, all varieties did fairly well, and many of them ripened their seed. Below is given, in tabular form, the result of this test, coupled with some short notes on those kinds deemed worthy of special mention. Sown with Planet Junr. hand drill in rows 30 inches apart, and afterwards thinned to 6 inches apart in the row.

BEANS.

Name of Variety.	Ready.	No. of Beans in Pod.	Productiveness.	Length of Pod.	Colour.	Flavour.
				In.		
Yellow 6 weeks	Aug. 18	6	Fairly productive.	5½	Light green	Fair.
Detroit Wax	″ 11	4	″ ″	4½	Dark yellow	Good.
Boston Favorite	″ 22	4	Very ″	6	Dark green	Very good.
Refugee, or 1000 to 1	″ 30	4	Fairly ″	6	Light green	Fair.
New Stringless Green Pod	″ 8	5	Very ″	5½	″	Good.
Cylinder Ivory Pod	″ 7	5	″ ″	5	Dark yellow	″
Wilson's Golden Eye	″ 20	5	Fairly ″	3½	Green	Poor.
Dwarf Triumph	″ 12	4	Very ″	4½	″	Good.
Marvel of Paris	″ 17	5	Fairly ″	5	″	″
Ne Plus Ultra	″ 9	6	Very ″	6	″	Very good.
Defiance	″ 10	3	Not ″	5	″	Good.
Pink Eyed Wax	″ 12	4	Fairly ″	4½	Light yellow	Fair.
Speckled Wax	″ 20	4	″ ″	5	Dark ″	Good.
Blue Podded Butter	″ 20	5	Very ″	5	Blue	″
Dwarf Lyonaise	″ 23	4	″ ″	6	Dark green	″
Early Giant Wax	″ 17	4	″ ″	6¼	Dark yellow	Very good
Davis' Wax	″ 20	4	Fairly ″	4½	Green	Fair.
Scarlet Flageolet Wax	″ 13	5	Very ″	7½	Dark yellow	Very good.
Golden Eyed Wax	″ 14	4	Fairly ″	4¾	Light ″	Good.
Improved Navy	″ 20	4	Very ″	5	Green	Fair.
Best of All	″ 15	4	Fairly ″	5¼	″	Good.
California Pea	″ 25	4	″ ″	4	″	Poor.
Early China	″ 10	5	Very ″	5⅛	″	Good.
White Field	″ 15	5	″ ″	4½	″	Fair.
Canadian Wonder	″ 10	5	″ ″	7	Dark yellow	Very good.
Early Golden Wax	″ 11	4	Fairly ″	4¼	″	″
Mohawk	″ 9	5	Very ″	5½	Green	″
Saddleback Wax	″ 12	5	Fairly ″	5	Light yellow	″
Black Eyed Wax	″ 12	6	″ ″	5½	″	″
Dwarf Horticultural	″ 10	5	Very ″	4¾	Dark green	Fair.
Giant Yosemite Wax	″ 12	4	″ ″	6¼	Light yellow	Very good.
Mexican Prolific Tree	Did not produce fruit.					

BEANS—*Continued.*

Name of Variety.	Ready.	No. of Beans in Pod.	Productiveness.	Length of Pod.	Colour.	Flavour.
				In.		
Nettle Leaved Bagnolet.......	Aug. 10..	4	Very productive.	6	Green.........	Very good.
White Valentine..............	" 15..	5	Fairly " .	5	Light green...	Fair.
Challenge, Black Wax........	" 10..	4	Very " .	4	Light yellow..	Good.
Round Podded................	" 12..	4	" " .	4	Light green...	Fair.
Currie's Rust Proof..........	" 20..	5	" " .	5	Dark yellow..	Good.
White Kidney................	Did not produce fruit.					
Large White Marrowfat.....	"		"			
Keeney's Rustless Golden.....	Aug. 12..	4	Very " .	4¼	Light yellow..	Good.
Burpee's Bush Lima..........	Did not produce fruit.					
Soya Bean	"		"			
Early, White-seeded Wax.....	Aug. 20..	4	Fairly " .	5	" ..	Fair.

The following varieties are worthy of special mention :—

Boston Favourite.—A green bean, with long pod, and very productive.

Ne Plus Ultra.—An extra early variety, having green, flat, fleshy pods, and exceedingly productive.

Blue Podded Butter.—Rather an oddity in beans. The pods, which are produced abundantly, are of a blush black colour. Flavour good.

Early Giant Wax.—A yellow bean, producing long pods, and very productive. A good variety for general purposes.

Scarlet Flageolet Wax.—A wax bean of large size, and very productive.

Canadian Wonder.—This was undoubtedly the best variety tested this season. Its long, yellow pods, of good flavour, are borne in profusion. An attractive market sort.

Mohawk.—A green podded bean, pods long, flat and straight. Very productive.

Giant Yosemite Wax.—Very large, yellow pods, abundantly produced, of excellent flavour.

Nettle Leaved, Bagnolet.—Straight long green pods. Very productive.

SQUASH AND PUMPKINS.

Fifty varieties of the above were sown on 21st May and germinated well, with four exceptions. viz. : *Mediterranean and Mammoth Whale Squash*, and *Tenessee Sweet Potato* and *White Cushaw Pumpkins.* The protracted spring frosts, cut the young plants badly, but as the seed was sown thickly, all varieties that had germinating power were found to be represented on the approach of settled weather. Owing to the dry season and our inability to irrigate, no heavy weights were recorded, but taking the above drawbacks into consideration, the growth and yield was remarkable, the many curious forms of this variable order proving a source of interest to visitors. The correctness of our previous views, with reference to the special adaptability of the bush forms of squash for this province, was again amply demonstrated, the compact form, and early setting propensities of these varieties making them very desirable. The seeds were sown outside in hills 8 feet apart each way, and the block was surrounded by a double row of corn to act as a windbreak. This precaution proved to be a good one, for it entirely prevented the usual damage occasioned to this class of plants, by the high winds exper-

ienced here. Following arranged in tabular form are the results of this test, together with a few notes on varieties specially suited for this climate.

Name of Variety.	Ready for Use.	Weight.	Colour of Flesh.	Outside Colour.	Shape.	Form.
		Lbs				
Delicata	Sept. 10	15	Light yellow	Green and yellow	Oblong	R.
Orange Marrow	Aug. 20	8	Orange "	Orange	Round, pointed at end	R.
Eureka	Sept. 15	10	Greenish "	Light yellow	Oblong	R.
Red China	" 1	5	Bright "	Orange	Round, flattish	R.
Large Yellow Chili	" 10	20	Orange "	Light yellow	Pumpkin-shaped	R.
Pineapple	Aug. 20	8	White	White	Scalloped	R.
Straight Neck	" 14	6	Light yellow	Orange yellow	Warted	B.
New Egg	" 12	10	Whitish yellow	Deep "	Long	B.
Valparaiso	Sept. 10	10	Greenish "	Light "	Field pumpkin type	R.
Bay State	Aug. 17	6	Dark "	Mottled green	Turban-shaped	R.
Der Wing	" 25	4	Greenish "	White	Warted	R.
*Mammoth Whale						
*Mediterranean						
Green Mountain	Sept. 5	15	Greenish yellow	Dark green	Elongated	R.
†Fordhook						
†Marble-Head						
†Cocoanut						
Italian Striped	Aug. 8	8	Cream yellow	Green and yellow striped	Oblong	B.
†Leonard's Golden Heart						
Sibley or Pike's Peak	Sept. 10	12	Greenish yellow	Slate colour	Oblong	R.
French Olive-shaped	Aug. 20	6	Yellow	Deep yellow	Round	R.
English Vegetable Marrow	" 20	7	Greenish white	Light cream	Oblong	R.
Rennie's Green Mammoth	" 25	60	Green and white marbled	Greenish yellow	"	R.
Golden Bush Scalloped	" 14	6	Light yellow	Deep orange	Scalloped	B.
Early White Bush Scalloped	" 14	6	Whitish	White	"	B.
Golden Custard	" 15	6	"	Deep yellow	"	B.
Cocozelle Bush	" 12	8	Yellowish white	Green and yellow striped	Long	B.
Long White Bush Marrow	" 8	10	White	Creamy white	"	B.
Turban or Turk's Cap	Sept. 10	12	Yellow	Deep orange	Turban	R.
Hubbard	" 18	10	Greenish yellow	" green	Oval	R.
†Perfect Gem						
†Faxon						
Early Crookneck	Aug. 20	6	Yellow	Deep orange	Crooked	B.
White Pineapple	" 14	7	Greenish yellow	White	Scalloped	B.
White Chestnut	Sept. 1	8	Whitish	Very white	Oval	R.
Warted Marrow	Aug. 14	7	Greenish white	White	Warted	R.
†Etampo (P)						
†Calhoun (P)						
Sweet or Sugar (P)	Sept. 1	10	Yellow	Deep yellow	Field pumpkin type	R.
Japanese Pie (P)	" 10	15	Greenish yellow	" green	Twisted	R.
Jumbo (P)	" 15	39	Light "	" yellow	Field pumpkin type	R.
Mammoth Prize (P)	Aug. 20	14	" "	" "	Flattish	R.
Mammoth Tours (P)	" 23	15	Greenish "	Gray	Field pumpkin type	R.
Nantucket or Negro (P)	Sept. 5	10	Light "	Dark	"	R.
Winter Luxury (P)	" 15	18	" "	Netted	"	R.
Large Field (P)	Aug. 25	25	Deep "	Deep orange	"	R.
*White Cushaw (P)						
*Tennessee Sweet Potato (P)						
Golden Oblong (P)	Sept. 10	17	Light yellow	Yellow	Oblong	R.
100 Weight (P)	" 15	15	Yellow	Deep yellow	Field pumpkin type	R.

* Did not germinate. † Did not produce fruit.

N.B.—P=Pumpkin. R. running form B. bush form.

The following is a list of varieties that appear to be specially adapted to this province :—

Long White Bush Marrow.—This variety as usual heads the list. It is of bush form, producing in profusion its long, white and well-flavoured fruit at an early date. Always succeeds here.

Italian Striped Marrow.—A bush variety; fruit long, green, striped with yellow; of fine flavour and very early.

Cocozelle Bush.—Very similar to above.

New Egg Plant.—A very prolific bush form; fruit oblong and of fair flavour; early.

Extra Early Orange Marrow.—A running variety that should do well here. The fruit is very attractive, and fine for pies.

English Vegetable Marrow.—A running form which is highly prized in England. As a vegetable its flavour is delicious; fairly early.

Pumpkin, Sweet or Sugar.—A typical pie variety, of medium size and earliness.

Winter Luxury.—Apparently a good keeper; of good size and quality. When ripe the fruit is beautifully netted, making it very attractive.

LIST of Varieties specially suitable for

Pies.		Vegetables.	
Orange Marrow	S	Pine Apple	S
Red China	S	New Egg	S
Yellow Chili	S	Italian Striped	S
Bay State	S	English Veg., Marrow	S
Green Mountain	S	Cocozelle Bush	S
Olive shaped	S	Long white Bush Marrow	S
Turban or Turk's Cap	S	Early Bush Scalloped	S
Hubbard	S		
Etampes	P		
Sweet or sugar	P		
Japanesse Pie	P		
Jumbo	P		
Mammoth Prize	P		
Negro	P		
Winter Luxury	P		

N.B.—S. Squash. P. Pumpkin.

CUCUMBERS.

Four varieties of the above were sown outside in hills, on 21st May and three varieties in hotbeds (for inside culture) on 15th April. Although the former were badly cut by the frosts previously mentioned in my report, they eventually recovered and produced a fine crop of fruit. Following are the results :

OUTSIDE SOWING.

Variety.	Ready.	Colour.	Shape.	Flavour.	Weight.	Productiveness.	Length.
White Spine.....	Aug. 13.	Light green...	Short, spiny..	Good.....	9 oz..	Fairly productive.	8 inches..
Cool and Crisp...	" 20.	Dark green...	" " ..	"	8 " ..	" " ..	8 " ....
White Wonder...	" 10.	Creamy white.	" " ..	"	10 " .	Very " ..	8 " ....
Gherkins.......	Sept. 1.	Light green...	Oval, spiny...	"	Small..	Poor.........	For pickling

INSIDE SOWING.

Variety.	Ready.	Colour.	Shape.	Flavour.	Weight.	Productiveness.	Length.
White Spine.....	July 3.	Light green...	Short, spiny..	Good.....	5 oz..	Fair.........	5 inches..
White Wonder...	" 15.	Creamy white.	" " ..	"	4 " ..	Poor...	4½ " ....
Telegraph.......	" 7.	Dark green...	Long smooth..	Very good	24 " ..	Very.........	18 " ....

The "White Wonder," as a forcing variety, was a failure, while outside, it was the most productive variety, although not generally grown here, it has much to recommend it to market gardeners, viz. :—Earliness, productiveness and excellent flavour, and colour for pickling, it no doubt will soon work its way into public favour. "Telegraph" again demonstrated its superiority as a forcing variety. The "Gherkins" were late.

GARDEN LEMON OR VEGETABLE PEACH.

This was sown 21st May in hills outside, and ripened 10th September. It comes highly recommended from the seedsmen, but did not fulfil expectations. The fruit, when ripe, is of the size of a lemon, and similarly coloured, with a centre resembling a miniature musk-melon. Flavour of the flesh (which consists of a very narrow strip), sub-acid and disagreeably perfumed. It is credited with making a fine preserve, but we found it far inferior to the citron in this respect.

TOBACCO.

A sample of tobacco seed was received from the Department of the Interior for testing purposes. Sown in hotbed on 8th April, and transplanted into boxes on 23rd April, and planted outside on 16th June. Following is the result:

Variety.	Harvested.	Height of Plant.	Length of Leaf.	Width of Leaf.
Havana....................	August 17th ...	3 feet............	22 inches..........	10 inches.

Fearful of frost, which in previous tests have spoilt the leaf, this was harvested before it was properly ripened, although had it been allowed to stand, it would probably have ripened this season on account of the peculiarly open fall. The product was dried as carefully as possible, and a sample has been forwarded to an expert for examination, but has not yet been reported on. The average season does not appear to be long enough for the varieties that have been tested up to the present, to mature. The leaf grown this year would answer for tree spraying purposes, and it might be advisable to grow a small quantity each year, with that end in view.

MISCELLANEOUS VEGETABLES.

Representative varieties of the following vegetables were grown: onions, salsify, lettuce, broad beans, tomatoes, corn, carrots, savory herbs, radishes, celery, cabbage, cauliflower, turnips and beets, but (with the exception of the four latter) did not attain their usual standard. Asparagus of which we have four varieties represented here, was above the average, the cool spring greatly prolonging the production of edible shoots. It is worthy of remark, that in tomatoes, Early Ruby and Earliest of All, again proved themselves specially desirable varieties for Manitoba, the wisdom of severely pruning this vegetable, being also again apparent.

THE FLOWER GARDEN.

It was deemed advisable last season to change the site of the flower garden from the hill-side, to a more level situation in front of the superintendent's house, which has proved to be an advantage, as this location is entirely free from the annual spring wash, which was usually troublesome, in connection with the former site. Twenty varieties of annuals, and about sixty varieties of perennials were planted, and, during the summer, made a very creditable showing. It is pleasing to note the increased interest shown in this branch of work every year, many inquiries being made, especially with regard to the perennial flowers.

The following tabulated list gives particulars showing period of flowering, hardiness, etc., of the different varieties tested :—

ANNUALS.

Variety.	How Sown.	Date Sown.	Date Transplanted.	Planted Out.	Flowering Period.
Salpiglossis variabilis......	Boxes in hotbed.	April 6..	April 19–25....	June 9 15..	June 20 to frost.
Gaillardia Lorenziana.....	" ..	" 6..	" 19–25....	" 9–15..	July 3 "
Phlox Drummondii	" ..	" 6..	" 19–25....	" 9 15..	" 20 "
Petunias, double..........	" ..	" 6..	" 19–25....	" 9–15..	" 15 "
" single..........	" ..	" 6..	" 19–25....	" 9–15..	" 12 "
Verbenas, mixed..........	" ..	" 6..	" 19–25....	" 9–15..	" 20 "
Asters, mixed types.......	" ..	" 6..	" 19–25....	" 9–15..	" 25 "
Antirrhinum, dwarf	" ..	" 6..	" 19–25....	" 9–15..	" 10 "
Nicotiana affinis..........	" ..	" 8..	" 19–25....	" 9–15..	" 1 "
Stocks, mixed types.... ..	" ..	" 6..	" 19–25....	" 9–15..	" 1 "
Zinnia elegans.	" ..	" 6..	" 19–25....	" 9 15..	June 20 "
Marigolds, mixed..........	Outside	Self sown.	Not transplanted	....	July 1 "
Sweet pease, mixed........	"	April 30..	" ..	....	" 1 "
Nasturtiums, dwarf.......	"	May 15..	" ..	....	June 20 "
Candytuft, mixed..........	"	" 15..	" ..	....	" 25 "
Larkspur, mixed..........	"	" 15..	" ..	....	Aug. 1 "
Poppy, paeony flowered ...	"	" 15..	" ..	....	June 25 to Aug. 5.
" the Shirley........	"	" 15..	" ..	....	" 23 "
Pyrethrum aureum	Boxes in hotbed.	April 6..	April 19–25....	June 9-15..	Foliage plant.
Lobelia compacta..........	" ..	" 6..	" 19–25....	" 9–15..	June 20 to frost.

Asters, usually so good here, were not a success this season. Nearly all the flowers were blighted and only partially expanded. The trouble was general in this district.

Stocks contained an exceptionally large amount of single flowers this year.

PERENNIALS.

Variety.	When Planted.	Flowering Period.	Hardiness.
Eryngium macrocarpa	1894	July 10 to Aug. 5	Very hardy.
Sedum medenezii	1894	" 1 to July 30	"
Hemerocallis fulva	1894	" 15 to Aug. 25	"
" flava	1894	" 20 to " 10	"
Aconitum Kusmalowi	1894	" 25 to frost	"
" Napellus	1894	Did not flower	Questionable.
Coreopsis lanceolata	1894	June 7 to Aug. 20	Very hardy.
Lychnis Chalcedonica	1893	" 27 to " 7	"
Salvia (variety ?)	1894	" 15 to July 10	"
" lavandulifolia	1894	" 20 to " 10	"
Delphinium grandiflorum	1894	July 10 to Aug. 20	"
" Dwarf	1894	" 19 to " 20	"
Campanula Grasseckii	1894	" 25 to " 15	"
Papaver orientale	1894	June 10 to June 30	"
" nudicaule	1894	May 20 to frost	"
Phlox (Perennial)	1894	Aug. 10 "	Fairly hardy.
Pæony Double	1893	June 28 to July 12	Very hardy.
Dictamnus fraxinella	1894	Did not flower	"
Anthemis coronaria	1894	July 5 to frost	"
Veronica salurgoides	1894	" 20 to Aug. 20	"
Gaillardia aristata	1894	June 28 to " 1	"
Linum perenne	1893	" 5 to July 10	"
Aquilegias (in variety)	1893	" 1 to " 25	"
Platycodon grandiflorum	1893	Did not flower	"
" " album	1893	July 20 to Aug. 10	"
Dielytra spectabilis	1893	June 15 to July 10	"
Lilium tigrinum	1893	Aug. 10 to frost	"
Convallaria majalis	1894	Did not flower	"
Grass Pinks	1894	June 23 to Aug. 1	"
Iris Germanica (in variety)	1893	" 18 to July 5	"
" sibirica "	1895	" 13 to June 30	"
" " alba	1894	Did not flower	Unhealthy.
" biglumis	1894	June 24 to July 6	Very hardy.
Thalictrum aquilegifolium	1894	Did not flower	"
Scilla sibirica	1893	May 1 to June 1	"
Tulips (in variety)	1893 to 1897.	" 9 to " 30	"
Dahlias "	1894	Aug. 5 to frost	Lifted in fall.
Gladiolus "	1893 to 1897.	" 14 "	"

The following varieties, have only survived one winter, and although very promising, their hardiness cannot as yet be positively stated :—

Name of Variety.	Whether flowered or not.
Lychnis Haageana Hybrid	Flowered.
Hemerocallis Flava fl. pl	"
" Fulva fol. var	"
" Kwanso fl. pl	"
" grandiflora	"
Hesperis matronalis	"
Hollyhocks Lorenz's Prize	"
Polemonium reptans	"
Baptisia australis	Did not flower.
Myosotis palustris	Flowered.
Orobus lathyroides	"
Salvia argentea	Did not flower.
Galega officinalis	Flowered.
" alba	"
Stachys lanata	Did not flower.
Gysophila paniculata	Flowered.
Iberis sempervirens	Did not flower.

Avenue of Box-elder trees, *Acer negundo*, at the Experimental Farm at Brandon, Manitoba, nine years planted.

The following varieties, have only survived one winter, &c.—*Concluded.*

Name of Variety.	Whether flowered or not.
Penstemon murrayanus	Flowered.
Glaucium luteum	"
Asclepias tuberosa	Did not flower.
Stenactis speciosa	Flowered.
Alyssum argenteum	"
Agrostemma coronaria	"
Fragaria indicia	"
Centaurea macrocephala	"
Iberis Gibraltarisa	"
Lychnis Chalcedonica alba	"
Saponaria ocymoides	"

ROSES.

As stated in last year's report, two varieties of roses were alive in the fall of 1896, viz., Mad. Bruant and Gem of the Prairies. The former came through the winter in very poor condition, and did not long survive its removal to permanent location. Gem of the Prairies made vigorous growth and flowered, and from all appearances promises to be a very hardy variety. The colour of the flower is a deep pink, and it is very sweetly scented. Another variety (the identity of which is in doubt) was received from a local grower and came through the winter of 1896 in fine condition without any protection. It flowered from 17th to 25th July, the bud being long, pointed and sweet scented. Twelve varieties were received from the Central Farm this season. These are named in the following list, and their condition described on the approach of winter.

Name of Variety.	Condition, Fall 1897.	Name of Variety.	Condition, Fall 1897.
Madame Geo. Bruant	Vigorous	Merveille de Lyon	Vigorous
" Victor Verdier	"	Marshal P. Wilder	"
" Plantier	"	Baron Prevost	"
" Gabriel Luizet	"	Francois Levet	Weak
Mlle Marie Rady	Weak	Caroline de Sansal	"
Crimson Rambler	"	Lady H. Stewart	Died soon after arrival.

The above were treated in the same manner as raspberry canes, being laid down, and covered with soil for winter protection. The result will be reported on next season.

HYACINTHS.

Last fall a test was made to ascertain if, by covering these bulbs very heavily, they could be brought through our severe winter. A piece of tar paper was first laid over the bed, extending four feet over each side, and on this was piled four feet of fresh manure. The covering was removed in the spring following, and the Hyacinths came up regularly and flowered well. From this it may be inferred that these most desirable bulbs, thus treated, may be grown here successfully.

COLLECTION OF PERENNIAL FLOWERING PLANTS.

A perennial bed has been commenced this fall, in which it is intended to have represented all the varieties of perennial flowers growing on the farm, and among them the best of our native perennials. There are at present 150 species and varieties represented in the collection, and additions will be made from time to time as plants are procurable.

DISTRIBUTION OF SEED GRAIN AND POTATOES.

The distribution of 3-pound samples of grain, etc., was larger this year than usual but owing to the limited supply of grain available we were only able to supply a fraction of the applications for 2-bushel lots of grain.

The following quantities were sent to applicants from this farm in spring :—

Wheat, 2 bushels or more	20
Oats " "	13
Barley " "	32
Pease " "	11
Grain of all kinds in 3-pound bags	357

From these many favourable reports have been received.

DISTRIBUTION OF POTATOES, ETC.

Potatoes in 3-pound bags	210
Maple seed, 1-pound bags	385
Flower seed, packages	488
Rhubarb " "	135
" roots "	130
Vegetable seed "	136
Perennial flowering plants, packages	94

The following reports have been received on the potatoes distributed :

Name of Variety.	No. Received.	No. Reporting Rot.	No. Reporting Scab.	Average Yield in lbs.	No. Reporting favourable.	No. Reporting unfavourable.
Everett	5	0	0	$59\frac{1}{5}$	5	0
Early Ohio	6	0	1	36	3	3
Pearce's Extra Early	5	0	1	$49\frac{1}{5}$	3	2
Lightning Express	1	0	0	31	1	0
Sharpe's Seedling	5	0	1	$34\frac{1}{5}$	4	1
Early Puritan	5	0	2	76	5	0
State of Maine	3	0	0	75	2	1
Daisy	6	1	2	55	4	2
Rural Blush	5	0	0	$54\frac{3}{5}$	5	0
Crown Jewel	3	0	1	89	3	0
Pearce's Prize Winner	2	0	1	40	2	0
Northern Spy C.E.F	1	0	0	92	1	0
Lee's Favourite	2	0	0	$42\frac{1}{2}$	1	1
I. X. L	1	0	0	54	1	0
Beauty of Hebron	1	0	0	25	1	0
Early Sunrise	1	0	0	30	0	1

NEW BREAKING.

As mentioned in a former report the grass land in the valley on this farm reserved for pasture has become run out, the ground being occupied mainly by White Anemone, Artemisia and Sunflowers. Each year portions of this part of the farm are being broken up and cropped with the result that much larger returns of hay and pasture have been obtained from the portions cultivated.

During the past summer 37 additional acres were broken up, back set and also well disc-harrowed late in the fall, this has completely broken up the decayed sod and brought the soil into excellent condition, and will probably give good returns next year.

FENCING.

The wire and rail fencing erected in 1889 and 1890 on the outer boundaries of the farm have given good satisfaction, and no heaving of posts has taken place.

During the past season forty-five rods of additional fence has been built across the northern cattle pastures and 220 rods on the Assiniboine River banks at the extreme southern boundary of the farm, this latter fence has enabled us to utilize the 50 acres of pasture in this portion of the farm and the young stock have thriven well on the luxuriant pasture with the good water supply.

NEW BUILDINGS.

During the year a driving shed 72 x 20 feet, to be used for sheltering vehicles and implements has been built, this is open to the west and implements can be readily backed in when not in use.

A room has also been built in the superintendent's house over the office, providing accommodation much needed.

ROADS.

The roads laid out through the experimental farm here have proved very satisfactory, and the gravel has not been much cut up even with the heavy travel of the autumn months, and it is evident that good gravel properly applied is as suitable for rural roads in this province as it is in the east.

Nine hundred and ninety additional feet has been gravelled during the year, this is in addition to the repairs required to the roads already gravelled.

FARMERS' MEETINGS.

Since my last report addresses have been given at seventeen farmers' meetings. Nearly all of these were well attended and much interest taken in the work of the experimental farms.

The location and dates of the meetings are given below :—

January	4th,	1897,	Birtle.
"	11th	"	Elkhorn.
"	12th	"	Virden.
"	13th	"	Oak Lake.
"	14th	"	Douglas.
"	16th	"	Pipestone.
"	18th	"	Melita.
"	19th	"	Deloraine.
"	20th	"	Boissevain.
February	6th	"	Brandon.
"	15th	"	Stony Mountain.
"	16th	"	Manitoba Dairy Convention.
"	17th	"	Bird's Hill.
"	17th	"	Kildonan.
"	18th	"	Swine Breeders' Meeting, Winnipeg.
"	20th	"	Rosser.
December	4th	"	Brandon.

VISITORS.

It is evident, from the large increase of visitors each year, that the interest in the work of the farm is not abating.

During the past year 15,700 visited the farm, principally farmers and their families, many coming from distant parts of the province, and spending a day or two inspecting the various crops growing on the farm.

The month of July and the first two weeks in August is the most suitable time for this purpose, as the distinguishing features of the different varieties of grain, grasses, &c., can then be seen to the best advantage, and the trees and shrubs are also in full leaf.

METEOROLOGICAL RECORD.

Month.	Highest Temperature.	Lowest Temperature.	Total Rainfall.	Depth of Snowfall.	Total amount of Sunshine.	
			Inches.	Inches.	Hrs.	Min.
1896.						
November	30° above zero on 2nd.	40° below zero on 20th.	....	$23\frac{3}{4}$	62	6
December	39° " 10th.	33° " 1st.	....	10	71	9
1897.						
January	38° " 8th.	35° " 23rd.	....	$16\frac{1}{4}$	97	7
February	31° " 4th.	39° " 26th.	....	$13\frac{1}{2}$	125	5
March	40° " 31st.	41° " 14th.	....	12	145	8
April	74° " 17th.	10° above zero on 19th.	$\frac{4}{10}$	....	153	9
May	92° " 4th.	21° " 31st.	$\frac{3}{10}$	....	266	
June	100° " 13th.	26° " 5th.	$\frac{6}{10}$	....	205	4
July	96° " 28th.	41° " 27th.	$1\frac{1}{2}$	....	230	3
August	96° " 12th.	33° " 30th.	$2\frac{3}{10}$	....	236	3
September	94° " 8th.	25° " 16th.	$\frac{4}{10}$	....	237	3
October	80° " 6th.	6° " 9th.	1	....	140	9
	Total, 1897	....	$6\frac{1}{2}$	$75\frac{1}{2}$	1,968	6
	" 1896	....	$14\frac{9}{10}$	$65\frac{1}{4}$	1,951	18

CORRESPONDENCE.

The correspondence from this office shows an increase each year, there were 2,900 letters received during the year and 3,060 despatched, this is irrespective of 1,558 circulars sent out.

I have the honour to remain, sir,
Your obedient servant,

S. A. BEDFORD, *Superintendent.*

Appearance of grounds surrounding house of Superintendent, Experimental Farm, Indian Head, N.W T., first year after building.

Appearance of grounds surrounding house of Superintendent, Experimental Farm, Indian Head, N.W.T., seven years after planting.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF ANGUS MACKAY, SUPERINTENDENT.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.,
31st October, 1897.

To DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR.—I have the honour to submit herewith to you the tenth annual report of the operations on the Experimental Farm for the North-west Territories at Indian Head, Assiniboia, during the year 1897.

The past season has, on the whole, been favourable over the greater portion of the Territories. In many districts the harvest has been very gratifying; in other portions the yield of grain has not been large but it is of excellent quality, and in no part has there been a complete failure. In addition to the fair crop, the good price commanded by almost everything grown or raised in the Territories has placed the farmers in a better position than has heretofore been attained.

Perhaps no previous year has shown the results of good farming to better advantage than the past season.

Spring opened about the 15th April, after one of the finest winters ever experienced in the North-west Territories. Snow fell early in November and lay till April, during which time sleighing was good, and at no time was the cold excessive. For weeks together almost perfect winter weather was experienced.

Seeding commenced on the experimental farm on the 16th April and continued without intermission till completed. High and continuous winds were prevalent during the last week of April, the whole of May, and from 1st to 15th June, when a heavy rain put an end to the winds and drouth which were threatening destruction of the crops in many portions of the Territories.

The rainstorm which passed over the experimental farm and district of Indian Head from 15th to 18th June inclusive was almost a deluge. On the 15th rain fell from 9.30 to 19 o'clock to a depth of 6·6 inches; on the 16th from 22 to 24 o'clock to a depth of 0·9 inch, and on the 18th from 13 to 19 o'clock to a depth of 2·5 inches—a total of 10 inches in four days. While the greater portion of this rain flowed over the land to the coulees, thence to the Qu'Appelle River, it ensured to the experimental farm and district an abundant crop of grain. Unfortunately the heavy rains extended over a small area, and in several districts the rain-fall was below the average. Nevertheless good farming in these districts caused a fair crop where in former years total failure would have been the result.

Smut caused little or no loss the past season. Where any took place, neglect in using bluestone as a preventive, or carelessness in the treatment of the seed was the sole cause.

Weeds, on the other hand, were very prevalent; and the dangerous ones, such as Stink-weed and Hare's Ear Mustard, are fast spreading in many—if not in every—district in the Territories.

The harvest was the earliest on record in the North-west, and with the usual harvest weather in August and September, the grain was quickly secured. Threshing

proceeded without delay and long before cold weather set in, was completed. It is safe to say that no previous harvest has been taken off and threshed with less delay or expense and with so much satisfaction to the farmer.

Protection from winds is one of the needs of the Territories, and as the soil becomes fine from working and cropping, the need becomes more apparent. For several years past the experimental farm has sustained considerable injury from winds. Last spring, however, the wind-breaks and hedges afforded protection to a large portion of the crop and on only a few fields was the grain injured. Other farms in the district, with no protection, suffered severely.

Barley was the most uniform and the best crop grown on the experimental farm the past season. A few one-tenth acre plots not protected were more or less damaged by wind, but on the whole the thirty-five varieties sown on large and small areas gave heavy yields of grain and straw.

Wheat tests of one-tenth acre each were not exposed to winds, and produced a large quantity of straw, with varied yields of grain, caused partially by dead heads in some parts and the excessive yield of straw in others. Winds swept continuously over the acre and larger plots causing lighter yields.

About one-half of the one-tenth acre plots of oats suffered more or less from winds, but on the whole the returns were satisfactory. The acre and field lots suffered a good deal and the yields were lighter. Where sown on stubble-land the crop was very poor.

Pease were the most surprising crop grown. Though repeatedly cut down by winds and frost up to 15th June, when the rains came nothing on the farm made more rapid progress, and the yields were very satisfactory. The sample surpasses any previously grown on the farm.

The hay crop on the farm was much better than it at one time promised. Before the rains came only low spots and margins of fields grew to any extent, but the rains made a wonderful change in a few weeks, and though parts, especially of fields sown four or five years ago, were light, the crop generally was good. Brome grass requires some moisture early in the spring to give it a start, and although it will grow with less than any other variety, May rains are worth a great deal to it.

The root crop was not at all satisfactory. Up to 15th June, when rains came, neither turnips, mangels, carrots, nor sugar-beets had appeared above ground. This also applies to corn and millets sown on the experimental farm, and to potatoes and vegetables generally in many portions of the Territories. July and August were dry months, and the growth was checked soon after starting, giving poor returns.

Potatoes and vegetables on the experimental farm, though late in starting, gave, in many cases, very fair results.

Small fruits, with the exception of strawberries, were a good crop. Wild fruits were a failure.

Trees and shrubs made a very satisfactory growth, and less of the new varieties died this year than ever before.

EXPERIMENTS WITH SPRING WHEAT.

Thirty-eight varieties of wheat were tested in $\frac{1}{10}$ acre plots, six of the same varieties again on plots of one acre each, and five sorts on five and ten acre fields. The $\frac{1}{10}$ acre plots were on a field protected by hedges from the prevailing winds, and did not suffer in the least. The acre plots and five and ten acre fields were more exposed and all sustained more or less injury.

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

Red Fife and Stanley were used. The plots were $\frac{1}{10}$ acre each, and the soil a clay loam. The first plots were sown on the 17th of April, and six successive sowings were made a week apart, the last plots being sown on the 22nd of May. The plots came up

and matured in the order sown. As will be seen, the three first seedings gave the best returns. There was no rust on any of the plots.

Seed sown by hoe-drill, on fallow at rate of 1½ bushel per acre.

WHEAT—Sown at Different Dates.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Length of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
				In.	In.	Lbs.	Bus.	Lbs.	Lbs.
Stanley	April 17.	Aug. 21.	126	48	3	5,590	37	40	61
"	" 24.	" 27.	125	48	3	4,700	36	40	61½
"	May 1.	" 27.	118	45	3	4,500	36	50	62
"	" 8.	" 31.	115	45	3	4,160	30	40	62
"	" 15.	Sept. 2.	110	42	3	3,850	31	40	63
"	" 22.	" 6.	107	39	2½	3,450	25	50	62
Red Fife	April 17.	Aug. 27.	132	45	3	5,650	39	10	62¼
"	" 24.	" 27.	125	45	3	4,540	37	40	62
"	May 1.	" 31.	122	45	3	4,270	35	30	62½
"	" 18.	Sept. 2.	117	45	3	4,170	34	40	63
"	" 15.	" 2.	110	45	3	4,450	35		62¼
"	" 22.	" 10.	111	45	3	5,250	33	20	62

TEST OF VARIETIES ON ONE-ACRE, FIVE-ACRE AND TEN-ACRE FIELDS.

In these tests the more promising varieties of wheat grown in previous years were sown, not only to test the grain on larger areas but for the purpose of obtaining seed in quantities for distribution or for sale for seed. The plots were exposed to winds and sustained more or less injury therefrom. The soil chosen for these tests was a clay loam. Most of the varieties were slightly rusted, but no smut was observed on any of them.

WHEAT—Field-lots.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
Sown on.	Acres.				In.	In.	Lbs.	Bush.	Lbs.
Red Fife, summer-fallowed	10	April 17	Aug. 25	130	42	3¼	3,500	33	50
" corn stubble, fall ploughed	3½	" 16	" 27	133	42	3	3,480	32	45
White Fife, summer-fallowed	2½	" 19	" 25	128	43	3	4,120	30	25
Wellman's Fife "	2½	" 19	" 25	128	44	3¼	3,360	28	41
Preston " "	5	" 20	" 27	129	45	3¾	3,700	28	8
Stanley " "	5	" 20	" 25	127	44	3	3,870	27	44

Acre Plots.

Hungarian, summer-fallowed	1	April 20	Aug. 23	125	39	2½	4,340	30	45
Monarch "	1	" 20	" 30	132	44	3	4,050	30	7
Red Fern "	1	" 20	" 23	125	45	3½	4,230	29	30
Emporium "	1	" 20	" 27	129	40	3	3,250	27	40
White Russian "	1	" 20	" 30	132	44	3	2,940	24	10
Percy "	1	" 20	" 23	125	42	2½	3,120	23	57

SPRING WHEAT TEST OF VARIETIES.

Thirty-eight varieties were sown by hoe-drill on fallow on the 24th of April, at the rate of $1\frac{1}{2}$ bushel per acre. The soil was a clay loam, and the plots, which measured one-tenth acre each, were protected from winds. Many of the varieties made a rank growth of straw but produced a poor sample of grain. No rust was observed on any of these plots.

WHEAT—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bus.	Lbs.	Lbs.
Hungarian	Aug. 21..	119	39	Weak....	$2\frac{1}{2}$	Bearded..	4,630	42	..	63
Countess	" 21..	119	32	"	$2\frac{1}{2}$	" ..	4,180	40	20	$63\frac{3}{4}$
Admiral	" 21..	119	45	Strong....	$3\frac{1}{2}$	Bald.....	5,040	40	10	$62\frac{1}{4}$
Vernon	" 27..	125	39	Weak....	$3\frac{1}{2}$	Bearded..	4,810	39	..	61
Herisson Bearded	" 28..	126	42	Strong....	2	" ..	5,510	39	..	65
Percy	" 21..	119	45	Weak....	3	Bald.....	4,930	38	40	63
Red Fern	" 27..	125	45	"	4	Bearded..	6,240	38	30	63
Wellman's Fife	" 28..	126	45	Strong....	$3\frac{1}{2}$	Bald.....	4,580	37	50	$62\frac{1}{4}$
Progress	" 21..	119	48	Weak....	$2\frac{1}{2}$	"	4,080	37	50	$62\frac{1}{2}$
Red Fife	" 27..	125	45	Strong....	3	"	4,380	37	50	63
Alpha	" 21..	119	45	"	3	Bearded..	5,710	37	20	62
Pringle's Champlain	" 21..	119	42	Weak....	$3\frac{1}{2}$	" ..	5,420	37	10	61
Huron	" 21..	119	45	Strong....	$3\frac{3}{4}$	" ..	5,230	37	..	$61\frac{1}{2}$
Old Red River	" 28..	126	45	"	$3\frac{1}{2}$	Bald.....	4,240	36	50	63
Emporium	" 28..	126	48	"	$3\frac{1}{2}$	Bearded..	4,400	36	40	$63\frac{3}{4}$
Rideau	" 21..	119	42	Weak....	$2\frac{1}{2}$	Bald.....	3,680	36	10	62
Beaudry	" 30..	128	48	Strong....	3	Bearded..	4,830	36	10	64
Captor	" 21..	119	42	"	$2\frac{1}{2}$	Bald....	4,690	36	..	$62\frac{1}{2}$
Preston	" 27..	125	42	Weak....	$3\frac{1}{2}$	Bearded..	4,690	36	..	$63\frac{1}{2}$
Crown	" 21..	119	45	Strong....	3	" ..	4,710	35	40	$62\frac{1}{4}$
White Fife	" 28..	126	45	"	3	Bald.....	4,370	35	30	63
Monarch	" 27..	125	45	"	$2\frac{3}{4}$	"	4,430	35	20	62
White Connell	" 28..	126	45	"	3	"	4,430	35	20	63
Dawn	" 21..	119	32	Weak....	3	"	4,150	35	..	62
Advance	" 27..	125	42	"	$3\frac{1}{2}$	Bearded .	4,820	33	50	$63\frac{1}{2}$
Beauty	" 21..	119	48	"	3	Bald....	4,350	33	20	$60\frac{1}{4}$
Campbell's White Chaff	" 28..	126	45	Strong....	3	"	4,050	32	30	59
White Russian	" 28..	126	42	"	3	"	3,740	31	50	61
Rio Grande	" 28..	126	45	Weak....	3	Bearded..	4,550	31	40	$62\frac{1}{4}$
Golden Drop	" 28..	126	48	Strong....	3	Bald.....	4,140	31	10	62
Stanley	" 24..	122	45	"	3	"	4,440	31	..	$60\frac{1}{2}$
Black Sea	" 21.	119	48	"	3	Bearded..	4,810	30	40	61
Blenheim	" 28..	126	48	"	$3\frac{1}{2}$	" ..	4,420	30	30	62
Dufferin	" 27 .	125	42	Weak....	3	" ..	4,500	29	10	$61\frac{1}{2}$
Ladoga	" 30..	128	48	Strong....	3	" ..	3,930	28	40	62
Dion's	" 27..	125	45	Weak....	$3\frac{1}{2}$	" ..	6,210	27	20	$63\frac{1}{4}$
Goose	" 27..	125	42	" ...	3	" ..	4,820	27	10	63
Colorado	" 28..	126	45	"	3	" ..	4,150	25	..	62

WHEAT—Test of Sowing Seed at different Depths.

Sown by hoe-drill, on fallow, on the 22nd April, on clay loam at rate of 1$\frac{1}{2}$ bushel per acre. A great difference will be observed between the different depths of seeding. Size of plots $\frac{1}{10}$ acre each.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bus	Lbs	
Red Fife—1 inch deep............	Aug. 23..	123	45	Strong....	3	5,600	40	..	62$\frac{1}{4}$
" 2 "	" 23..	123	45	" ..	3	5,560	40	40	62$\frac{1}{4}$
" 3 "	" 23..	123	42	" ..	3	4,820	33	50	62

YIELDS and average for past six years.

Name of Variety.	1892.		1893.		1894.		1895.		1896.		1897.		Average.	
	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.
*Red Fife—1 inch deep.....	....	..	..	....	.....	.....	.....	.....	38	30	40		39	15
" 2 "	27	00	41	20	15	20	45	00	39	15	40	40	34	45
" 3 "	22	30	37	10	18		37	30	38	50	33	50	31	18

*Not tested previous to 1896.

WHEAT—Test of sowing different quantities of seed, per acre.

Sown on the 22nd April, by hoe-drill, on clay loam, summer-fallowed. Size of plots $\frac{1}{10}$ acre each.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs	Bus.	Lbs.	Lbs.
Red Fife—1 bushel per acre... ...	Aug. 25..	125	45	Strong....	3	5,440	38	30	62$\frac{1}{4}$
" 1$\frac{1}{4}$ "	" 25..	125	42	"	3	5,720	38	50	62$\frac{1}{2}$
" 1$\frac{1}{2}$ "	" 25..	125	42	"	3	4,930	38	40	62

YIELDS and average for past six years.

Name of Variety.	1892.		1893.		1894.		1895.		1896.		1897.		Average.	
													Bus.	Lbs.
Red Fife—1 bushel per acre.	35	50	28	20	14	30	35	50	38	30	38	30	31	55
" 1$\frac{1}{4}$ " ..	40	..	28	..	11	40	44	..	40	10	38	50	33	46
" 1$\frac{1}{2}$ " ..	39	40	26	30	13	20	42	20	38	20	38	40	33	8

WHEAT—Test of Press *vs.* Hoe-drill.

Sown on the 22nd April, on clay loam, summer-fallowed, at the rate of 1½ bushel per acre. Size of plots $\frac{1}{10}$ acre each.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bus.	Lbs.	Lbs.
Red Fife, sown press-drill	Aug. 21..	121	45	Strong....	3	5,190	41	..	62¼
" "	" 21..	121	48	"	3	4,610	39	..	62

YIELDS and average for past six years.

Name of Variety.	1892.		1893.		1894.		1895.		1896.		1897.		Average.	
													Bus.	Lbs.
Red Fife, press-drill........	30	20	38	20	18	40	45	..	41	30	41	..	35	48
" hoe-drill...	24	..	36	18	17	50	44	..	40	40	39	..	33	38

BLUESTONE AS A REMEDY FOR SMUT IN SPRING WHEAT.

Seed used.	Treatment.	Good Heads on 25 Sq. Feet.	Smutty Heads on 25 Sq. Feet.
Red Fife, clean seed....................	Bluestoned, 1 pound to 10 bush.......	1,342	....
" "	Untreated	1,014	244
" smutty seed	Bluestoned, 1 pound to 8 bush.......	1,110	21
" "	Untreated............................	741	643

For the above tests bluestone was dissolved in water, in the proportion of one pound to two pailsful. In this solution the seed was dipped. The smutty seed used was quite black and totally unfit for any purpose whatever.

TEST OF FALLOW *vs.* SPRING AND FALL PLOUGHING FOR WHEAT.

1st. Ten acres of fallow-land was sown by hoe-drill at rate of 1½ bushel per acre on 17th April.

2nd. Three acres of corn-stubble were ploughed in October, 1896 and harrowed. Sown by hoe-drill at rate of 1½ bush. per acre on 16th April, and harrowed after seeding.

3rd. One acre of burnt stubble-land was ploughed, three inches deep by gang-plough on 29th April, 1897 ; then harrowed and sown by press-drill at the rate of 1½ bush. per acre on same day.

4th. One acre of burnt stubble-land was sown by press drill without ploughing at the rate of 1½ bushel per acre on 29th April, then rolled.

Following will be found return from each plot :—

Plot No.	No. of Acres.	Method of Cultivation.	Bushels per Acre.
1	10	Red Fife on fallow	33·50
2	3	" fall ploughing	32·45
3	1	" stubble, spring ploughed	24·33
4	1	" " not ploughed	26·07

The fallow-land was considerably blown while the others did not suffer from winds.

EXPERIMENTS WITH BARLEY.

Barley was the best crop on the farm the past season, and having no wind or rain storms after the crop headed out, the grain all stood up and was easily harvested. The straw, especially that of the six-rowed varieties, was extra fine. All varieties were cut back by wind-storm on 13th June, but rain coming two days after soon repaired the injury.

TEST OF EARLY, MEDIUM AND LATE SOWINGS.

Two varieties were used in this test, Canadian Thorpe, a two-rowed sort and Odessa, a six-rowed variety. The soil was a clay loam and the size of the plots $\frac{1}{10}$th acre each. The first plots were sown on 24th April, one week after the first seeding of wheat, and the sowings were continued on the same day each week for five weeks or until 29th May. The seed was sown on summer-fallowed land by hoe-drill at the rate of 2 bushels per acre. The twelve plots were protected by a wind-break and did not suffer from winds but six of them were frozen down on 13th May. All the plots ripened in the order sown but the early seedings gave much the better yields of grain and straw.

BARLEY—Test of Early, Medium and late Seeding.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Canadian Thorpe	April 24	Aug. 17	115	45	Strong	3	4,310	58	6	54½
"	May 1	" 17	108	45	"	3	4,050	56	12	53
"	" 8	" 20	104	45	"	3	4,230	46	22	54¼
"	" 15	" 20	97	45	"	3	3,920	44	18	53¾
"	" 22	" 24	94	36	"	3	3,350	44	38	51¼
"	" 29	" 30	93	36	"	3	3,000	43	6	50½
Odessa	April 24	" 13	111	39	"	2½	3,890	75	..	50
"	May 1	" 17	108	39	"	2½	4,210	77	4	49½
"	" 8	" 17	101	39	"	2½	4,450	64	18	50
"	" 15	" 17	94	39	"	2½	4,600	71	2	49¾
"	" 22	" 20	90	39	"	2½	4,060	61	12	49¾
"	" 29	" 28	91	39	"	2½	2,750	53	6	49½

BARLEY—Field Lots.

Seed sown from the 3rd to the 5th of May on summer-fallow, by hoe-drill at the rate of $1\frac{3}{4}$ bushels per acre, soil clay loam.

Name of Variety.	Size of Plot.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	
				In.		In.		Bush.	Lbs.
Odessa	5 acres..	Aug. 13..	102	42	Strong ...	$2\frac{1}{2}$	6 rowed ..	56	40
Trooper	5 " ..	" 13..	102	40	" ..	3	6 " ..	54	20
Canadian Thorpe	5 " ..	" 17..	105	45	" ..	4	2 " .	45	6
Sidney	4 " ..	" 21..	108	45	" ..	$3\frac{1}{2}$	2 " ..	44	8

BARLEY—Acre Plots.

Six varieties were sown on the 5th of May on clay loam on plots of one acre each: two on corn stubble-ploughed six inches deep and harrowed and four on summer-fallow. Winds thinned the plots on summer-fallow. Seed sown by hoe-drill at rate of $1\frac{3}{4}$ bushel per acre.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	
			In.		In.		Bush.	Lbs.
Baxter's—Corn stubble	Aug. 13..	100	42	Strong ...	3	6 rowed...	48	33
French Chevalier—Fallow	" 21..	108	40	" ...	$4\frac{1}{2}$	2 " ..	48	6
Bolton— "	" 18..	105	36	" ...	$3\frac{1}{2}$	2 " ..	45	32
Mensury— "	" 18..	105	36	" ...	3	6 " ..	44	29
Oderbruch—Corn stubble	" 13..	100	40	" ...	2	6 " ..	40	40
Beaver—Fallow	" 21..	108	40	" ...	$2\frac{1}{2}$	2 " ..	38	26

BARLEY—Test of Varieties.

In this test twenty varieties of six-rowed and fifteen varieties of two-rowed barley were sown.

A few plots were slightly injured by winds, and all were cut down by frost on the 13th of May, but speedily recovered after rain on the 15th of June, and gave heavy crops of grain and straw.

Seed was sown on the 5th of May on fallow by hoe-drill, at the rate of two bushels per acre. The soil was clay loam, and the size of the plots was one-tenth acre each. Baxter's and Phœnix both suffered somewhat from smut, all the other varieties were free from smut.

SIX-ROWED BARLEY—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bus.	Lbs.	Lbs.
Common	Aug. 12	99	36	Strong	3	4,180	71	12	53¼
Oderbruch	" 12	99	36	"	2½	3,690	71	2	53¼
Petschora	" 12	99	36	"	2½	3,740	70	..	51¼
Odessa	" 12	99	36	"	3	3,630	68	6	51½
Rennie's Improved	" 13	100	36	"	3	3,780	68	6	53
Mensury	" 12	99	39	"	3½	4,140	66	42	50
Baxter's	" 12	99	36	"	2	3,750	66	32	53
Vanguard	" 12	99	36	"	2¾	3,150	66	32	52¼
Blue	" 13	100	33	Weak	3	4,540	65	40	46¼
Royal	" 12	99	36	Strong	3	3,040	63	36	51
Stella	" 12	99	36	"	3	4,150	58	16	50¾
Trooper	" 12	99	33	"	2½	4,070	57	44	51½
Excelsior	" 13	100	42	"	3	3,280	57	34	47¼
Nugent	" 12	99	33	"	2	3,850	56	12	51¼
Summit	" 12	99	33	"	2½	3,530	55	30	53¼
Surprise	" 12	99	36	"	3	3,280	55	30	53
Champion	" 13	100	44	"	4	3,140	54	18	48½
Success	" 6	93	42	"	3	2,820	51	32	51
Phœnix	" 13	100	39	"	3	3,340	51	12	50¾
Pioneer	" 17	104	36	"	3	3,260	49	38	54½

TWO-ROWED BARLEY—Test of Varieties.

French Chevalier	Aug. 24	111	33	Strong	5	3,390	53	16	52¼
Canadian Thorpe	" 21	108	33	"	4	4,300	53	6	54
Beaver	" 24	111	33	"	3	3,430	52	24	54¼
Danish Chevalier	" 24	111	30	"	5	3,250	52	4	53
Kinver Chevalier	" 28	115	33	"	3	3,900	51	2	52
Newton	" 20	107	36	"	3	3,550	51	2	53½
Rigid	" 20	107	36	"	3	4,040	50	10	53½
Prize Prolific	" 28	115	33	"	5	3,500	50	..	52¼
Nepean	" 20	107	36	"	4	4,360	47	34	54¼
Bolton	" 20	107	39	"	4	3,480	47	14	55¼
Victor	" 20	107	36	"	3½	3,160	45	30	54¼
Thanet	" 28	115	33	"	5	3,280	45	10	52
Sidney	" 24	111	36	"	4	3,200	44	38	54
Pacer	" 20	107	36	"	4	3,510	43	26	53
Monck	" 24	111	36	"	4½	5,000	37	24	54¼

TEST OF BLUESTONE AS A REMEDY FOR SMUT IN BARLEY.

Variety of Seed.	Treatment.	Good Heads.	Smutty Heads.
		On 25 Square Feet.	
Canadian Thorpe	Bluestone, 1 lb. to 10 bushels	750	3
" "	Untreated	711	97

EXPERIMENTS WITH OATS.

TEST OF EARLY, MEDIUM AND LATE SOWINGS.

Banner and Abundance were used in this test. The sowings were one week apart, and continued from 24th April to 29th May. The last sowing of each variety gave a good crop of straw, but the yield of grain was small. The second seeding of Abundance was greatly injured by heavy rains in June, which washed away portions of the grain and soil. The plots were one-tenth acre each, and the soil a clay loam.

OATS—Test of Early, Medium and Late Seeding.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				Inches.		Lbs.	Bush.	Lbs.	Lbs.
Banner	April 24	Aug. 18	116	48	Strong	3,800	101	16	39
"	May 1	" 21	112	45	"	3,280	78	18	36
"	" 8	" 21	105	46	"	3,540	90		37¼
"	" 15	" 21	98	46	"	3,400	88	8	37
"	" 22	" 30	100	45	"	3,150	73	18	36¼
"	" 29	Sept. 6	100	42	"	3,660	49	24	33¼
Abundance	April 24	Aug. 21	119	43	"	3,830	78	18	39½
"	May 1	" 23	114	42	"	2,950	63	8	37½
"	" 8	" 23	107	43	"	3,440	91	16	39¼
"	" 15	" 23	100	45	"	3,680	84	14	39½
"	" 22	" 30	100	45	"	3,430	69	24	37
"	" 29	Sept. 6	100	42	"	3,150	58	28	37

OATS—Field-lots.

Sown on the 28th and 29th of April on summer-fallow by hoe-drill at the rate of 2¼ bushels per acre. The soil was clay loam. All the fields were injured by frosts and winds.

Name of Variety.	Size of Plot.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Kind of Head.	Weight of Straw.	Yield per Acre.	
				Inches.			Lbs.	Bush.	Lbs.
Banner	5	Aug. 26	120	44	Strong	Branching	3,060	69	30
Abundance	5	" 26	120	42	"	"	3,670	65	12
Golden Beauty	5	" 26	119	42	"	"	2,510	63	21
Improved Ligowo	2½	" 18	111	40	"	"	2,480	63	2
Holstein Prolific	1¼	" 18	111	38	"	"	2,300	40	..

OATS—One Acre Plots.

Sown 29th April on summer-fallow by hoe-drill at rate of 2¼ bushels seed per acre. All suffered from winds, being on a very exposed portion of the farm. The soil was clay loam.

Name of Variety.	Size of Plot	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Kind of Head.	Weight of Straw.	Yield per Acre.	
					In.		Lbs.	Bush.	Lbs.
Early Archangel	1 acre	April 29	Aug. 27	120	44	Branching	3,130	63	12
Oderbruch	1 "	" 29	" 18	111	36	Sided	2,120	63	9
Bavarian	1 "	" 29	" 18	111	38	Branching	2,980	60	25
White Schonen	1 "	" 29	" 27	120	36	"	2,950	59	25
Early Golden Prolific	1 "	" 29	" 18	111	40	"	3,000	59	13
Flying Scotchman	1 "	" 29	" 27	120	36	"	2,960	56	24
American Beauty	1 "	" 29	" 26	119	44	"	2,340	56	6
Columbus	1 "	" 29	" 27	120	39	"	3,100	53	8
Wallis	1 "	" 29	" 26	119	45	"	2,630	52	14
Wide-Awake	1 "	" 29	" 30	123	40	"	2,230	40	

The following were all sown on the same date, 3rd May, on clay loam, summer-fallowed. The size of the plots was, in most instances, one-tenth acre each. The seed was sown by hoe-drill at the rate of 2¼ bushels per acre.

OATS—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw	Character of Straw.	Kind of Head.	Weight of Straw	Yield per Acre.		Weight per Bushel.
			In.			Lbs.	Bush.	Lbs.	Lbs.
Abyssinia	Aug. 30	119	45	Strong	Sided	3,490	87	2	39
Improved American	" 30	119	48	"	Branching	3,200	86	26	38
Siberian O.A.C	" 20	109	48	"	"	4,800	86	16	37¼
Columbus	" 20	109	45	"	"	4,080	86	30	37¼
Olive	" 30	119	48	"	Sided	4,360	85		37½
Rosedale	" 30	119	46	"	"	3,650	83	28	40½
Hazlett's Seizure	" 20	109	48	"	Branching	4,550	82	12	42¼
Early Gothland	" 20	109	45	"	Sided	4,050	82	12	39
Early Golden Prolific	" 23	112	43	"	Branching	2,370	80	10	35
Golden Giant	" 30	119	48	"	"	3,920	80	10	34
Mennonite	" 30	119	45	"	"	3,130	80		38
Holstein Prolific	" 23	112	42	"	"	2,560	80		37
Flying Scotchman	" 23	112	44	"	"	3,540	79	24	40
Buckbee's Illinois	" 28	117	46	"	"	3,660	79	4	38
Early Blossom	" 30	119	48	"	Sided	3,660	79	4	39
Early Maine	" 30	119	46	"	Branching	2,990	78	8	38¼
Oxford	" 28	117	45	"	"	3,160	77	22	38¼
American Beauty	" 20	109	36	"	"	2,770	75	30	38
Early Archangel	" 20	109	45	"	"	3,820	75	30	39¼
Finland Black, No. 1	" 23	112	42	"	"	3,310	74	24	36
Wide Awake	" 20	109	42	"	"	3,570	74	14	40
Cromwell	" 23	112	45	"	"	3,200	73	30	36
Wallis	" 28	117	46	"	"	3,440	73	28	37
Lincoln	" 20	109	42	"	"	3,240	73	28	39¼
Medal	" 30	119	43	"	"	2,840	73	28	39
Poland	" 27	106	42	"	"	3,460	73	8	41¼

OATS—Test of Varieties—*Continued.*

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.			Lbs.	Bush.	Lbs.	Lbs.
Miller	Aug. 30	119	43	Strong	Branching	2,410	73	8	38
Improved Ligowo	" 20	109	43	"	"	1,870	72	32	39
Black Beauty	" 28	117	36	"	"	2,570	72	32	36
White Schonen	" 28	117	45	"	"	3,500	72	2	35
Bavarian	" 20	109	42	"	"	3,200	72	2	34¼
Early Etampes	" 23	112	32	"	"	3,380	71	16	37
White Russian	" 20	109	42	"	"	3,890	71	12	40¼
Welcome	" 17	106	45	"	"	3,590	71	12	43¼
White Monarch	" 30	119	42	"	"	3,060	70	10	39
Prize Cluster	" 17	106	45	"	"	3,490	69	14	43½
Russell	" 23	112	42	"	"	3,000	69	4	37¼
California Prolific Black	" 23	112	46	"	Sided	3,410	68	28	36¼
Pense	" 23	112	43	"	"	4,110	68	28	37½
Winter Grey	" 17	106	42	"	Branching	3,220	68	18	42¼
Master	" 28	117	46	"	"	3,270	68	18	37¼
Bonanza	" 17	106	45	"	"	3,060	67	12	41¼
Scottish Chief	" 20	109	42	"	"	3,260	67	12	41½
Oderbruch	" 20	109	45	"	Sided.	1,860	67	12	38
Imported Irish	" 17	106	45	"	Branching	3,170	67	2	42¼
King	" 17	106	42	"	"	2,880	66	26	34¼
Rennie's Prize	" 17	106	42	"	"	2,800	66	6	42¼
White Wonder	" 17	106	46	"	"	3,100	66	6	42¼
Cream Egyptian	" 20	109	45	"	"	3,420	65	20	42¼
Doncaster Prize	" 30	119	42	"	"	3,620	65	20	39¼
Siberian	" 30	119	48	"	Sided	4,120	65	20	35¼
Golden Tartarian	" 28	117	42	"	"	2,540	63	18	34¼
Mortgage Lifter	" 17	106	45	"	Branching	2,350	63	8	41
Abundance	" 28	117	45	"	"	3,520	62	22	35
Golden Beauty	" 20	109	42	"	Sided	2,340	61	16	35
Prolific Black Tartarian	" 28	117	36	"	Branching	3,190	60	20	38
American Triumph	" 20	109	45	"	....	2,220	59	24	35
Newmarket	" 23	112	42	"	Branching	1,800	58	28	39
Coulommiers	" 28	117	36	"	"	3,000	57	22	37¼
Scotch Hopetoun	" 28	117	45	"	"	3,290	57	22	34¼
Joanette	" 23	112	32	"	"	2,520	56	16	37
Finland Black, No. 2	" 20	109	40	"	"	2,520	55	10	33¼
Brandon	" 28	117	43	"	Sided	2,420	52	12	35
Banner	" 28	117	36	"	Branching	3,330	52	2	31
*Victoria Prize	" 28	117	45	"	"	3,040	50	10	41¼

* Blown out; resown 14th June.

EXPERIMENTS WITH PEASE.

The yield of pease from the different varieties was, on the whole, satisfactory Early in the season winds and frost several times apparently ruined the plots, but after the rains came in June nothing on the farm made such rapid progress or, considering the thinning out the pease had sustained, gave better returns. The plots protected by trees gave larger returns of grain and straw than those in more exposed positions. A finer sample of all the varieties was never grown on the farm.

TEST OF EARLY, MEDIUM AND LATE SOWINGS.

In this test, Mummy, a large and Golden Vine a small variety were used. Commencing on 24th April the sorts were sown each week till 29th May. The three plots

of Golden Vine giving the larger yields were entirely under the protection of a wind break. The other plots were all more or less injured.

The soil was a clay loam and the size of the plots one-tenth of an acre. The land was summer-fallow and the seed sown at the rate of 2½ bushels small pease and 3½ bushels large pease per acre.

PEASE—Test of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Size of Pea.	Yield per Acre.		Weight per Bushel.
					In.	Lbs.		Bush.	Lbs.	Lbs.
Mummy	April 24	Aug. 23	121	Rank	36	3,110	Large	30		65¼
"	May 1	" 23	114	"	36	3,740	"	27	30	65¼
"	" 8	" 23	107	"	36	3,300	"	28	20	66¼
"	" 15	" 23	100	Medium	35	3,320	"	28		67
"	" 22	" 25	95	Weak	36	3,200	"	33		67
"	" 29	Sept. 1	95	"	26	2,400	"	19	20	66
Golden Vine	April 24	Aug. 23	121	Very rank	48	4,890	Small	51	10	65
"	May 1	" 23	114	Rank	40	4,000	"	42	50	65¼
"	" 8	" 23	107	"	36	3,900	"	41	10	65¼
"	" 15	" 23	100	"	36	3,650	"	34		65¼
"	" 22	" 25	95	"	36	3,320	"	31	20	65
"	" 29	Sept. 1	95	Medium	28	2,550	"	22	50	65

PEASE—Test of Varieties.

Forty-one varieties were sown on summer-fallowed land on the same date, the 6th of May, on a clay loam, and the size of the plots, in most instances, was one-tenth of an acre. The seed was sown by hoe drill at the rate of 2½ bushels per acre for the small varieties and 3½ bushels for the larger sorts.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Length of Straw	Weight of Straw.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	Lbs.		Bush.	Lbs.	Lbs.
Potter	Aug. 24	110	Rank	34	4,280	Large	45	10	64
Bright	" 26	112	"	32	4,200	"	40		65
Centennial	" 25	111	"	32	4,850	"	35	40	65⅓
Prince Albert	" 24	110	"	36	3,620	Small	34	40	65¼
Golden Vine	" 24	110	"	32	3,750	"	34	10	65
Daniel O'Rourke	" 21	107	Medium	30	3,610	"	34	10	66
Arthur	" 23	109	Rank	32	3,920	"	34	10	66
New Potter	" 26	112	Medium	30	3,900	Large	33	20	64
Victoria	" 24	110	Rank	32	3,625	"	33		66½
Crown	" 24	110	"	32	3,530	Small	32	50	66¼
Macoun	" 26	112	"	30	3,030	Medium	32	20	66¼
White Marrowfat	" 26	112	"	36	4,120	Large	31	50	65
Trilby	" 24	110	Medium	28	3,200	Medium	31	50	65
Vincent	" 24	110	"	30	3,330	"	31	40	65¼
Creeper	" 25	111	"	30	3,620	Small	30	50	65
Carleton	" 24	110	Rank	34	3,790	Medium	30	40	66¼
Alma	" 23	109	Medium	30	3,050	Large	30	30	65¾
White Wonder	" 20	106	Rank	30	3,820	"	30	10	67
Multiplier	" 25	111	Medium	30	4,150	Small	30		66
Pride	" 23	109	Rank	33	3,910	Large	29	50	65¼

PEASE—Test of Varieties—*Continued.*

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	Lbs.		Bush.	Lbs.	Lbs.
Nelson	Aug. 19	105	Weak	30	3,560	Large	29	40	65½
Perth	" 23	109	Rank	27	3,500	"	29	30	65¼
Paragon	" 24	110	"	28	3,740	"	29	30	64½
Canadian Beauty	" 25	111	"	32	3,650	"	29		65
Black Eyed Marrowfat	" 25	111	"	32	3,330	"	28	50	64½
Mummy	" 24	110	"	33	3,620	"	28	50	65¼
Chancellor	" 17	103	Medium	30	3,510	Small	28	40	65¾
King	" 25	111	"	30	3,520	Large	28	40	65¼
Duke	" 23	109	Weak	24	2,610	"	28	30	65
Early Britain	" 19	105	Rank	36	3,720	"	28		64½
Prince	" 25	111	Medium	28	3,340	"	27	30	66
Bedford	" 26	112	Rank	32	3,300	Small	27	20	66½
Bruce	" 24	110	Medium	28	3,000	"	27	10	65
Oddfellow	" 19	115	Rank	34	3,680	Medium	27		68½
Kent	" 24	110	Medium	27	3,110	"	26	20	65¾
Archer	" 25	111	"	28	3,150	"	26	10	65¼
Elephant Blue	" 19	105	"	30	3,310	Large	25	50	64¼
Agnes	" 23	109	"	29	3,040	"	24	50	65
Prussian Blue	" 24	110	"	31	3,320	"	24	30	65¼
Mackay	" 24	110	Rank	30	3,400	"	23	20	65¼
Harrison's Glory	" 19	105	Weak	24	2,780	"	22		64¼

MIXED GRAIN FOR FODDER.

Four grain mixtures were sown on one-tenth acre plots on summer-fallow on 26th April and cut by binder on 18th August. All the plots were allowed to partially mature before being cut.

	Mixture.	Seed sown per acre.	Weight per acre. Dry.	
			Tons.	Lbs.
1	Barley—Odessa	1 bush.	4	200
	Oats—Banner	1 "		
2	Wheat—Red Fife	1 bush.	4	...
	Barley—Odessa	1 "		
	Rye—Spring	1 "		
3	Oats—Banner	1 bush.	3	650
	Pease—Golden Vine	1 "		
4	Wheat—Red Fife	1 bush.	3	500
	Pease—Golden Vine	1 "		

EXPERIMENTS WITH INDIAN CORN.

Thirty varieties were tested. All were planted on the 19th of May in hills, three feet apart each way and twenty-seven of the same varieties were sown by hoe-drill in rows three feet apart. The land was clay loam, fallowed in 1896. Two rows of sixty-six feet each were cut from each variety and from this the yield per acre was computed. As will be seen the corn sown in rows gave better returns than the same varieties planted in hills. This is accounted for by the seed in the rows germinating shortly after being sown which was caused by deep seeding—3 inches; whereas that planted in hills was ten days later in germinating and the plants never overtook those grown in rows.

INDIAN CORN—Test of Varieties.

Test of Variety.	Character of Growth.	Height.	When Tasselled.	In Silk.	Early Milk.	Condition when cut.	Weight per Acre grown in rows.		Weight per Acre grown in hills.	
		In.					Tons.	Lbs.	Tons.	Lbs.
Giant Prolific Ensilage	Strong	84	Aug. 17.	Sept. 3.	....	Silk	16	450	11	1,650
Sanford	"	60	" 12.	Aug. 26.	....	"	15	1,900	14	1,600
Cuban Giant	"	96	" 14.	" 28.	....	"	15	250	12	1,190
Cloud's Early Yellow	"	84	" 15.	" 21.	Sept. 4.	Early milk	14	50	11	1,320
Early Butler	"	72	" 11.	" 29.	....	Silk	13	1,170	10	1,230
Pride of the North Dent	"	72	" 17	Sept. 3.	....	"	13	950	11	1,650
North Dakota White	"	72	" 11	Aug. 24	Sept. 4	Early milk	13	400	11	1,430
Mammoth Sweet Fodder	Fair	54	" 5	" 16	" 3.	"	12	1,850	9	700
Canada White Flint	Strong	72	" 12.	" 24.	....	Silk	12	1,850	12	750
Red Cob Ensilage	"	78	" 17.	Sept. 1.	....	"	12	1,300	13	950
Mitchell's Extra Early	"	48	" 5	Aug. 25	Sept. 1	Early milk	12	1,300	11	...
Kendall's Giant	Fair	48	" 5	" 12.	Aug. 28	Late milk.	12	1,300	9	1,030
Mammoth Eight-rowed Flint	Strong	72	" 11.	" 28.	....	Silk	12	1,200	11	870
Mammoth Yellow Flint	"	72	" 10	" 28	....	"	12	860	12	640
Burpee's First of All	Fair	48	" 3	" 12	Sept. 1.	Early milk	12	750	7	960
North Dakota Yellow	"	72	" 10.	" 20.	....	Silk	12	1,200	11	1,100
Pearce's Prolific	"	54	" 12.	Sept. 1.	....	"	12	1,200	6	1,200
Longfellow	"	60	" 12.	Aug. 28.	....	Silk	12	1,200	9	1,140
Compton's Early	"	60	" 12	" 24	Sept. 4.	Early milk	11	1,870	12	1,850
Ninety-day	"	72	" 17	" 26.	" 4	"	11	1,650	8	1,930
Champion White Pearl	"	84	" 17	Sept. 1	....	Silk	11	1,650	11	1,650
New White Cap Yellow Dent	"	78	" 17	Aug. 26	Sept. 4.	Early milk	11	1,100	12	1,750
Wisconsin White Dent	"	76	" 11.	" 26.	" 3.	"	11	1,100	..	.....
Wisconsin Yellow Dent	"	80	" 12.	" 26.	" 4.	"	11	960	..	.....
Extra Early Huron Dent	"	74	" 12.	" 26.	" 4.	"	11	900	..	.....
King of the Earliest	"	72	" 11.	Sept. 1.	....	Silk	11	....	10	240
Selected Leaming	"	78	" 17.	Aug. 30.	....	"	10	1,450	9	1,800
Angel of Midnight	"	54	" 12	" 26	Sept. 4	Early milk	10	900	11	.....
Thoroughbred White Flint	Weak	60	" 17.	Sept. 1.	" 4.	"	8	1,600	6	1,200
Country Gentleman	"	48	" 15.	" 4.	....	Silk	8	500	5	1,220

FIELD CORN—SOWN FOR ENSILAGE.

North Dakota flint corn was sown on a five acre field for ensilage. The land had produced a crop of oats the year previous, was ploughed in the spring seven inches deep, well harrowed and rolled and the seed sown by grain drill, in rows three feet apart. The corn was sown on 20th May, but on account of dry weather did not germinate till 20th June. Twenty-one tons fifteen hundred pounds was the yield from the 5 acres.

Two acres of Mitchell's Extra Early corn were also sown for ensilage. The land produced a crop of flax and millet in 1896, and was deeply ploughed in the spring

before seeding with corn. Corn was sown by drill in rows three feet apart on 21st May. The plants on one of the two acres were thinned out to one every 12 inches in the row; the other acre was left as it came up.

The yield from the acre thinned was 8 tons, 260 pounds; from the acre not thinned, 7 tons 1,140 pounds. Both lots of Mitchell's Extra Early and the five acres of North Dakota flint were cut on 6th September by binder, left in the field to wilt for two days, then drawn and cut by ensilage cutter and put in silo. The ensilage is being used now and is in excellent condition.

The above varieties are early in maturing, and though less productive are used in preference to the later and larger yielding sorts.

EXPERIMENTS WITH FLAX.

Seed sown at Rate of	Date of Seeding.	Date of Cutting.	Days to Mature.	Length of Straw.	Weight of Straw per Acre.	Yield per Acre.	
				Inches.	Lbs.	Bush.	Lbs.
40 lbs. per acre...	May 11.....	Aug. 18....	99	24	820	6	30
80 " ..	" 11.....	" 18....	99	24	1,380	10	20
40 " ..	" 18.....	" 18....	92	24	1,370	12	30
80 " ..	" 18.....	" 18....	92	24	1,390	13	10
40 " ..	" 25.....	" 18....	85	22	1,470	13	30
80 " ..	" 25.....	" 18....	85	22	2,400	13	
40 " ..	" 29.....	" 18....	81	20	1,230	9	20
80 " ..	" 29.....	" 18....	81	20	1,890	13	10

EXPERIMENTS WITH MILLETS AND HUNGARIAN GRASS.

Variety.	Size of Plot.	Date Sown.	Date Cut.	Days to Mature.	Length of Straw.	Yield per Acre.	
	Acre.				Inches.	Tons.	Lbs.
New Siberian Millet......	$\frac{1}{10}$	May 8.....	Aug. 27....	111	36	2	400
Manitoba "	$\frac{1}{10}$	" 7.....	" 27....	112	32	1	150
Japanese "	$\frac{1}{10}$	" 7.....	" 27....	112	31	1	100
Hungarian Grass.........	$\frac{1}{10}$	" 7.....	" 27....	112	27	1	1,400
Manitoba Millet..........	$\frac{1}{20}$	" 12.....	" 27....	107	32	2	200
Garden "	$\frac{1}{20}$	" 12.....	" 27....	107	32	1	1,350
New Siberian "	$\frac{1}{20}$	" 12.....	" 27....	107	36	1	1,100
Holy Terror "	$\frac{1}{20}$	" 12.....	" 27....	107	30	1	700

EXPERIMENT WITH CANARY GRASS.

One-tenth acre was sown on 7th May. Ripe, 23rd Aug.. Yield per acre, 26 bushels seed, 3,250 pounds straw.

EXPERIMENT WITH BUCKWHEAT.

One-tenth acre was sown 7th May. Ripe, 27th Aug. Matured in 112 days. Height. 27 inches. Weight of straw per acre, 3,240 pounds. Yield of grain per acre, 22·24 bushels,

EXPERIMENT WITH TARES.

One plot of $\frac{1}{40}$ acre was sown for feed and another of the same size for seed.

Variety.	Size of Plot.	Date Sown.	Date Cut.	Length of Straw.	Weight of Straw. Per Acre.	Yield Per Acre.
For Feed.	Acres.			Feet.	*Green.*	Bush. Lbs.
Black Tares........................	$\frac{1}{40}$	May 7...	Aug. 9..	$4\frac{1}{2}$	17,540	
For Seed.					*Dry.*	
Black Tares......	$\frac{1}{40}$	May 7...	Aug. 28..	$4\frac{1}{2}$	3,410	33 30

EXPERIMENT WITH SPRING RYE.

One-tenth acre sown on 26th April, and cut for seed 6th Sept. ; 75 inches high : 4,200 pounds straw per acre ; 50·50 bushels grain per acre.

EXPERIMENTS WITH GRASSES

In the spring of 1896, five varieties of grass, viz., Awnless Brome Grass, Timothy, Meadow Fescue, Agropyrum Tenerum and Agropyrum Caninum were sown, also, Alsike, Red and Mammoth Clovers.

Awnless Brome Grass, Agropyrum Tenerum and Agropyrum Caninum were sown separately ; the others mixed and sown together. Red Clover was entirely killed, Alsike was also killed, except near protection, where snow lay till spring opened. Mammoth Clover was very thin and little or no Timothy appeared. Meadow Fescue was a fair crop, near the protection of the western wind-break, the yield was large ; away from it only fair. The yield of the mixed grasses was from $2\frac{3}{4}$ acres, 3 tons 300 pounds, or 1 ton 290 pounds, per acre.

Agropyrum Tenerum and Agropyrum Caninum. Both produced a good crop the past season, but neither variety is eaten by stock as readily as Awnless Brome Grass. Absence of leaves on the stalks is probably the reason for this. The varieties were sown very thin, and during the season of 1896 gave little promise of yielding a crop this year, but thin seeding proved an advantage during the dry weather in May, and a good crop resulted. Seed of Agropyrum Tenerum has been saved, and further experiments will be made with this grass. The following yields were obtained:

Agropyrum Tenerum—$1\frac{1}{4}$ acre : 3 tons, 1,205 pounds, or 2 tons 1,764 pounds per acre.

Agropyrum Caninum—$1\frac{1}{2}$ acre : 3 tons, or 2 tons 400 pounds per acre.

AWNLESS BROME GRASS (Bromus Inermis).

As stated in the report for 1896, a large area was sown with Brome Grass that spring. The grass made a good catch and growth, and gave excellent pasture up to the time snow fell last fall or about 1st November.

This spring a fair start was made about 20th April, but dry weather set in shortly after, and very little progress was made, except in low places or margins of the fields till 20th June. The rains a few days before this date made a rapid change and insured, on the whole, a fair yield, but not so good as would have been caused by an earlier rain. Parts of the fields were extra heavy, while other portions on knolls were short.

Thirty two tons of the grass were saved for seed, but it is not in a very satisfactory condition, in so far as a large yield of seed is concerned. Throughout the field reserved for seed. the early growth was ripe while the growth caused by the June rains was quite green, consequently much of the early seed was lost. On account of the large amount of green growth at the bottom, the mower instead of the binder was used in cutting the crop for seed. This makes threshing more difficult, but gives a very fine lot of fodder, as good in fact, as if cut for hay.

The older fields of Brome Grass gave light crops, several portions being very short and hardly worth cutting. Being an early grass to start, the past spring was greatly against a good crop, especially on fields from which several crops had been cut.

From several years' experience with Brome Grass, it appears, to obtain the best results in hay that two crops should be taken from the field, which should then be ploughed up unless required for pasture. While this will necessitate a little more work in sowing a fresh field or a few acres each spring and ploughing up the same amount of old grass land, various advantages will arise from the adoption of this course, 1st, good fodder will be supplied each year by the newly seeded land ; 2nd, there being a first crop of hay each year, it is likely to be a good one ; 3rd, Brome sod is easily ploughed after the second crop, but is very tough after the fourth or fifth ; 4th, the roots of the grass when ploughed up afford protection from winds and in this respect are equal, so far as experience shows, to the native sod ; this being the case it is evident that it will be a great advantage to other crops to treat old worked land in this way.

Without the heavy rain which fell on the farm in June last, it is probable that from the fields on which two crops had been previously cut, there would not have been one-half ton of hay per acre.

On 18th, 19th and 20th May, several acres of Brome sod were ploughed up. One portion was ploughed six inches deep ; a second, three inches deep, and a third one and one-half inch deep. The deep ploughing was sown with pease, harrowed well and rolled. The other portions rolled down, and on 23rd and 28th July backset five inches deep. The pease did not germinate till after rains on 15th and 18th June, and were caught by frost before maturing. There was, however, a good crop of straw and grain, the pods being well filled. Except where the first two furrows met no Brome Grass roots survived.

On the other portions some roots were still alive when the plots were backset, but at this date all seem to be dead.

Considering the large amount of rain which fell on 15th to 18th June, and the favourable growing weather for several weeks after, the growth on the land ploughed was very small indeed, and with our ordinary June rainfall there will not be the least difficulty in killing the roots of this grass by breaking and backsetting. One acre of sod five years old has, this fall, been ploughed four inches deep as a further experiment in getting rid of Brome Grass.

For information regarding sowing the following is quoted from the report for 1896

"This grass is better sown alone; at least it should not be sown with a grain crop. The grain takes too much moisture from the young grass plants, only the most vigorous of which will survive the dry weather in September; whereas, if sown alone all the plants have an equal chance.

"It is also advisable to sow the seed on soil that does not blow. Summer-fallow would be the best preparation, but on account of its liability to drift it is not safe in many parts of the Territories to use this kind of land. Stubble land ploughed three or four inches deep in April or May, and well harrowed after the seed is sown, is found to be quite safe from winds as the stubble harrowed on top prevents all drifting.

"Fifteen to eighteen pounds of seed is required per acre. More seed will give a better crop the first year, but less afterwards as the roots thicken up each year and in three or four years makes better pasture than hay.

"The seed being light, long and thin, seeding by hand is the only practicable method. To seed properly a calm day should be chosen, so that all parts of the land may be evenly sown.

"While the plants are young, weeds are sure to make great headway and it is necessary to keep them, at least from going to seed. The quickest way to accomplish this is to go over the field with a mower, cutting just above the grass-plants. If this operation has to be repeated it will be necessary to cut the tops of the grass, but this will not injure the plants, in fact it is an advantage in the way of giving the roots a better hold.

"The first crop of hay can be cut the next year after seeding, and will, in ordinary years be ready early in July. Eight or ten days after being ready to cut for hay it will be fit to cut for seed if so desired.

"On this farm it has always been cut in first blossom for hay and ten days from this time it is considered in proper state to cut for seed.

"In cutting for seed a binder is used and the grass is cut, tied and stooked the same as wheat or other grain. In a week or ten days after cutting it is ready to thresh or store away as deemed best.

"For threshing small quantities the old-fashioned flail is suitable, but for large lots a threshing machine should be used on which the wind has been closed off as much as practicable. From three to six hundred pounds of seed may be expected from an acre."

YIELDS.

Twenty acres from fields which have been cut 3, 4 or 5 times, 52,100 pounds or 1 ton 605 pounds per acre.

Twenty-two acres new crop 79,555 pounds or 1 ton 1,616 pounds per acre. (One acre of this field yielded 3 tons 1,000 pounds.)

EXPERIMENTS WITH ROOTS.

The root crop was very light the past season. No seeds germinated until the middle of June, nearly one month later than usual, and excessive rains for three days in June hardened the land to such an extent that it was in very bad condition to stand the dry weather which set in early in July and continued, with the exception of two or three days upon which showers fell, to the time the roots were taken up. The roots were on clay loam summer-fallowed land, which was ploughed before the seeds were sown.

Following will be found yields of two seedings each of turnips, mangels, carrots and sugar beets. The yield per acre, in each case, has been calculated from the weight of roots obtained from two rows each, 66 feet long.

TURNIPS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Are.—1st Plot. Tons.	Lbs.	Yield per Acre.—1st Plot. Bush.	Lbs.	Yield per Acre.—2nd Plot. Tons.	Lbs.	Yield per Acre.—2nd Plot. Bush.	Lbs.
Hartley's Bronze........	May 18	May 28	Oct. 5	Oct. 5	9	1,548	325	48	10	856	347	36
Aberdeen Purple Top....	" 18	" 28	" 5	" 5	9	1,140	319	..	13	1,894	466	24
Hall's Westbury........	" 18	" 28	" 5	" 5	8	1,424	290	24	10	268	337	48
Shamrock Purple Top...	" 18	" 28	" 5	" 5	8	596	276	36	10	460	341	..
Perfection Swede......	" 18	" 28	" 5	" 5	7	1,048	250	48	10	64	334	24
Selected Purple Top.....	" 18	" 28	" 5	" 5	7	520	242	..	9	348	305	48
Sutton's Champion.....	" 18	" 28	" 5	" 5	7	256	237	36	8	1,820	297	..
Skirving's.	" 18	" 28	" 5	" 5	6	1,464	224	24	9	1,932	332	12
Prize Winner	" 18	" 28	" 5	" 5	6	1,332	222	12	7	1,180	253	..
Marquis of Lorne........	" 18	" 28	" 5	" 5	6	672	211	12	6	1,860	231	..
East Lothian............	" 18	" 28	" 5	" 5	6	408	206	48	7	1,576	259	36
Jumbo or Monarch	" 18	" 28	" 5	" 5	6	408	206	48	8	896	281	36
Carter's Elephant..	" 18	" 28	" 5	" 5	5	1,352	198	12	7	1,312	255	12
Selected Champion......	" 18	" 28	" 5	" 5	5	560	176	..	6	1,992	233	12
Improved Greystone.....	" 18	" 28	" 5	" 5	5	332	172	12	5	1,880	198	..
Bangholm Selected	" 18	" 28	" 5	" 5	4	1,768	162	48	6	1,464	224	24
Mammoth Clyde........	" 18	" 28	" 5	" 5	4	1,504	158	24	6	1,464	224	24
Prize Purple Top........	" 18	" 28	" 5	" 5	4	1,372	156	12	10	1,648	360	48
Halewood's Bronze Top..	" 18	" 28	" 5	" 5	4	316	138	36	8	1,160	286	..
Giant King......	" 18	" 28	" 5	" 5	3	468	107	48	7	338	239	48

MANGELS—Test of Varieties.

Gate-post...............	May 18	May 28	Oct. 4	Oct. 4	12	420	407	..	13	1,984	466	24
Norbitan Giant	" 18	" 28	" 4	" 4	11	1,760	396	..	12	420	407	..
Giant Yellow Globe.....	" 18	" 28	" 4	" 4	11	1,628	393	48	13	1,324	455	24
Giant Yellow half-long ..	" 18	" 28	" 4	" 4	10	1,912	365	12	14	1,568	492	48
Champion Yellow Globe.	" 18	" 28	" 4	" 4	10	1,912	365	12	12	1,476	424	36
Yellow Intermediate	" 18	" 28	" 4	" 4	10	1,912	365	12	15	1,944	532	24
Mammoth Long Red....	" 18	" 28	" 4	" 4	10	1,780	363	..	13	268	437	48
Giant Yellow Intermediate, Steele	" 18	" 28	" 4	" 4	10	1,120	352	..	13	1,852	464	12
Selected Mammoth Long Red..	" 18	" 28	" 4	" 4	10	1,120	352	..	12	1,476	424	36
Prize Mammoth Long Red	" 18	" 28	" 4	" 4	10	988	349	48	13	1,456	457	36
Golden Fleshed Tankard.	" 18	" 28	" 4	" 4	9	1,404	323	24	13	1,852	464	12
Ward's Long oval-shaped.	" 18	" 28	" 4	" 4	9	480	308	..	13	268	437	48
Red Fleshed Globe	" 18	" 28	" 4	" 4	9	216	303	36	10	460	341	..
Giant Yellow Intermediate, Pearce............	" 18	" 28	" 4	" 4	9	216	303	36	13	664	444	24
Golden Tankard.........	" 18	" 28	" 4	" 4	8	1,820	297	..	12	684	411	24
Warden's Orange Globe..	" 18	" 28	" 4	" 4	8	896	281	36	11	1,628	393	48
Canadian Giant..........	" 18	" 28	" 4	" 4	7	388	239	48	11	176	369	36
Red Fleshed Tankard ...	" 18	" 28	" 4	" 4	6	1,728	228	48	8	92	268	12

CARROTS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Improved Short White...	May 14	May 27	Oct. 6	Oct. 6	3	1,524	125	24	3	468	107	48
Mammoth White Intermediate.......... ..	" 14	" 27	" 6	" 6	3	1,128	118	48	3	1,128	118	48
Iverson's Champion	" 14	" 27	" 6	" 6	3	996	116	36	4	448	140	48
White Belgian	" 14	" 27	" 6	" 6	3	852	114	12	3	1,392	123	12
Green-top White Orthe..	" 14	" 27	" 6	" 6	3	600	110	..	2	1,016	83	36
Guerande or Oxheart....	" 14	" 27	" 6	" 6	3	600	110	..	3	204	103	24
Half-long White	" 14	" 27	" 6	" 6	3	204	103	24	3	864	114	24
Half-long Chantenay....	" 14	" 27	" 6	" 6	3	72	101	12	3	1,524	125	24
Giant White Vosges.....	" 14	" 27	" 6	" 6	2	1,544	92	24	3	1,392	123	12
Early Gem...............	" 14	" 27	" 6	" 6	2	1,412	90	12	2	1,808	96	48
Carter's Orange Giant....	" 14	" 27	" 6	" 6	2	1,016	83	36	3	76	101	12
Scarlet Intermediate.....	" 14	" 27	" 6	" 6	2	1,016	83	36	2	352	72	36
Yellow Intermediate	" 14	" 27	" 6	" 6	2	1,016	83	36	2	1,676	94	36
Long Orange or Surrey..	" 14	" 27	" 6	" 6	2	752	79	12	2	620	77	..
Long Scarlet Altringham.	" 14	" 27	" 6	" 6	1	1,960	66	..	1	1,036	50	36

SUGAR-BEETS—Test of Varieties.

Danish Improved..	May 18	May 28	Oct. 4	Oct. 4	10	1,252	354	12	11	308	371	48
Danish Red-top.........	" 18	" 28	" 4	" 4	9	1,932	332	12	12	1,740	429	..
Improved Imperial	" 18	" 28	" 4	" 4	9	1,140	319	..	8	1,292	288	12
Wanzleben..............	" 18	" 28	" 4	" 4	8	632	277	12	11	704	378	24
Vilmorin's Improved....	" 18	" 28	" 4	" 4	7	1,180	253	..	7	1,120	257	..
Red Top Sugar.........	" 18	" 28	" 4	" 4	6	1,452	224	12	8	1,028	283	48

POTATOES.

One hundred and fifteen varieties of potatoes were tested.

One hundred of these were in uniform test plots and were planted on a piece of land which was afterwards nearly submerged by the rains of 15th–18th June, and out of the hundred varieties twenty-eight were entirely destroyed. The varieties giving the larger yields were on a high part of the plot and were not put back or injured by the water, on this account, the results reported on this year cannot be regarded as a reliable test of the relative productions of the different sorts planted. Many of the varieties were scabby and a great many small tubers were found in all the sorts. There were no rotten potatoes in any of the plots.

The potatoes were planted in rows thirty inches apart and twelve inches apart in the rows. The soil was a clay loam and the yield per acre has been calculated from the product of two rows each 66 feet long.

POTATOES—Test of Varieties.

Name of Variety.	Planted.	Dug.	Character of Growth.	Total Yield per Acre. Bush.	Lbs.	Yield per Acre of Marketable. Bush.	Lbs.	Yield per Acre of Unmarketable. Bush.	Lbs.
Lee's Favourite	May 17.	Oct. 4.	Fair	530	24	387	12	143	12
Northern Spy	" 17.	" 4.	"	530	24	387	12	143	12
Carman No. 3	" 17.	" 4.	"	451	..	396	..	55	..
Vick's Extra Early	" 17.	" 4.	"	389	24	264	..	125	24
World's Fair	" 17.	" 4.	"	387	12	290	24	96	48
Early White Prize	" 17.	" 4.	"	363	..	277	12	85	48
Brownell's Winner	" 17.	" 4.	"	330	..	290	24	39	36
Clarke's No. 1	" 17.	" 4.	"	330	..	246	24	83	36
White Beauty	" 17.	" 4.	"	325	36	228	48	96	48
Ohio Junior	" 17.	" 4.	"	321	12	246	24	74	48
I. X. L.	" 17.	" 4.	"	316	48	184	48	132	..
Seedling No. 230	" 17.	" 4.	"	314	36	224	24	90	12
Flemish Beauty Seedling	" 17.	" 4.	"	310	..	255	..	55	..
Dakota Red	" 17.	" 4.	"	305	48	279	24	26	24
New Variety No. 1	" 17.	" 4.	"	301	24	253	..	48	24
Seedling No. 7	" 17.	" 4.	"	292	36	246	24	46	12
American Wonder	" 17.	" 4.	"	290	24	176	:.	114	24
State of Maine	" 17.	" 4.	"	290	24	242	..	48	24
Early Sunrise	" 17.	" 4.	"	288	12	222	12	66	..
Charles Downing	" 17.	" 4.	"	286	..	169	24	116	36
Lizzie's Pride	" 17.	" 4.	Weak	283	48	255	12	28	36
Early Norther	" 17.	" 4.	"	277	12	237	36	39	36
Quaker City	" 17.	" 4.	"	272	48	211	12	61	36
Polaris	" 17.	" 4.	Rank	268	24	239	48	28	36
Dreer's Standard	" 17.	" 4.	Weak	266	12	226	36	39	36
Irish Daisy	" 17.	" 4.	"	262	..	233	24	28	36
Victor Rose	" 17.	" 4.	"	257	24	215	36	41	48
Holborn Abundance	" 17.	" 4.	"	255	12	176	..	79	12
Early Gem	" 17.	" 4.	"	248	12	193	12	55	..
Early Puritan	" 17.	" 4.	"	246	24	182	36	63	48
Prize-taker	" 17.	" 4.	"	246	24	206	48	39	36
Rural Blush	" 17.	" 4.	"	231	24	194	..	37	24
Reeve's Rose	" 17.	" 4.	"	231	..	195	48	35	12
Maggie Murphy	" 17.	" 4.	"	226	36	193	36	33	..
Holton Rose	" 17.	" 4.	"	226	..	176	..	50	..
Columbus	" 17.	" 4.	"	224	24	204	36	19	48
Algoma, No. 1	" 17.	" 4.	"	224	24	180	24	44	..
McKenzie	" 17.	" 4.	"	222	12	176	..	46	12
Pride of the Market	" 17.	" 4.	"	220	..	191	24	28	36
Daisy	" 17.	" 4.	"	217	48	156	12	61	36
Wonder of the World	" 17.	" 4.	"	215	36	158	24	57	12
Empire State	" 17.	" 4.		213	24	184	48	28	36
Satisfaction	" 17.	" 4.	"	211	12	176	..	35	12
Record	" 17.	" 4.	"	211	12	140	48	70	24
Hale's Champion	" 17.	" 4.	"	207	..	156	24	50	36
Stourbridge Glory	" 17.	" 4.	"	204	36	173	48	30	48
Fillbasket	" 17.	" 4.	"	198	..	143	..	55	..
Early Rose	" 17.	" 4.	"	198	..	171	36	26	24
Seedling No. 314	" 17.	" 4.	"	197	..	135	..	62	..
Russell Seedling	" 17.	" 4.	"	180	..	120	..	60	..
Vanier	" 17.	" 4.	"	173	48	138	36	35	12
Late Puritan	" 17.	" 4.	"	169	24	105	48	63	36
Harbinger	" 17.	" 4.	"	169	24	147	24	22	..
Reading Giant	" 17.	" 4.	"	160	36	118	48	41	48
Early Harvest	" 17.	" 4.	"	158	24	123	12	35	12
Irish Cobbler	" 17.	" 4.	"	156	12	105	36	50	36
Sharpe's Seedling	" 17.	" 4.	"	156	12	127	36	28	36
Delaware	" 17.	" 4.	"	151	48	112	12	39	36
Crown Jewel	" 17.	" 4.	"	145	12	110	..	35	12
Orphan's	" 17.	" 4.	"	138	36	94	36	44	..
Early Ohio	" 17.	" 4.	"	134	12	110	..	24	12
Everett	" 17.	" 4.	"	129	48	116	36	13	12
Seattle	" 17.	" 4.	"	129	48	101	12	28	36
Burpee's Extra Early	" 17.	" 4.	"	129	48	101	12	28	36

POTATOES.—Test of Varieties.—*Continued.*

Name of Variety.	Planted.	Dug.	Character of Growth.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.	
				Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Carman No. 1	May 17.	Oct. 4.	Weak	129	48	105	36	24	12
Rose No. 9	" 17.	" 4.	"	127	36	99	..	28	36
Beauty of Hebron	" 17.	" 4.	"	127	36	118	48	8	48
Hopeful	" 17.	" 4.	"	125	24	77	..	48	24
Good News	" 17.	" 4.	"	123	12	96	48	26	24
Burnaby Seedling	" 17.	" 4.	"	105	36	....		105	36
Troy Seedling	" 17.	" 4.	"	100	..	66	..	34	..
Table King	" 17.	" 4.	"	92	24	68	12	24	12
King of the Roses	" 17.	" 4.	"	79	..	52	48	26	12
Bill Nye	" 17.	" 4.	"	77	..	61	36	15	24
Honeoye Rose	" 17.	" 4.	"	48	24	35	12	13	12
Brown's Rot-proof	" 17.								
Clay Rose	" 17.								
American Giant	" 17.								
Chicago Market	" 17.								
Early Market	" 17.								
Earliest of all	" 17.								
Early Six-weeks	" 17.								
Freeman	" 17.								
Great Divide	" 17.								
General Gordon	" 17.								
Green Mountain	" 17.								
Irish Beauty	" 17.								
Ideal	" 17.								
Lightning Express	" 17.	Killed out by water.							
London	" 17.								
Monroe County	" 17.								
Money-maker	" 17.								
Peerless Junior	" 17.								
Pride of the Table	" 17.								
Pearce's Extra Early	" 17.								
Pearce's Prize Winner	" 17.								
New Queen	" 17.								
Queen of the Valley	" 17.								
Rochester Rose	" 17.								
Rural No. 2	" 17.								
Thorburn	" 17.								
Toronto Queen	May 17.	Oct. 4.	Fair	431	12	378	24	52	48
Great Northern	" 17.	" 4.	"	330	..	264	..	66	..
Uncle Sam	" 17.	" 4.	"	323	24	264	..	59	24
American Giant	" 17.	" 4.	"	297	..	242	..	55	..
Sir Walter Raleigh	" 17.	" 4.	Weak	264	..	193	36	70	24
Clarke's Extra Early	" 17.	" 4.	"	228	48	206	48	22	..
Maule's Thoroughbred	" 17.	" 4.	"	189	12	162	48	26	24
Puritan No. 1	" 17.	" 4.	"	187	..	171	36	15	24
Early London	" 17.	" 4.	"	173	48	149	36	24	12
Early Summer	" 17.	" 4.	"	171	36	132	..	39	36
She	" 17.	" 4.	"	162	48	99	..	63	48
Bovee	" 17.	" 4.	"	162	48	107	48	55	..
Wonderful Clayrose	" 17.	" 4.	"	134	12	114	24	19	48
Primrose	" 17.	" 4.	"	116	..	106	..	10	..

VEGETABLE GARDEN.

The spring being very dry during the whole of the month of May and the first half of June, was unfavourable for the vegetable garden. In places where snow banks had collected during the winter, and when melted left moisture, the vegetable seeds germinated quickly and gave good returns, but where there was little or no moisture from this source the seeds remained till 20th June before starting, and as a rule the returns were small. The season was favourable for anything started in the hot beds. Attention is drawn to the difference between onions started in the hot beds and those grown in the garden, details of which will be found following. The season was also very favourable for tomatoes, the weather both during the day and at night being warm for a longer period than is usual.

ASPARAGUS.

Three varieties were grown in beds planted in 1893 and 1891. These were Conover's Colossal, Barr's Mammoth and Donald's Elmira.

Donald's Elmira produced the largest stalks, but Conover's Colossal was the earliest and gave the best average cuttings. First cut 1st May, continued in use till 1st July.

BEANS.

Eleven varieties were tested.

Early Valentine Wax was fit for use on July 20.			
Pearce's Golden Beauty	"	"	24.
Kenny's Rust Proof	"	"	24.
Wardwell's Kidney Wax	"	"	24.
Golden Eye Wax	"	"	24.
Challenge Black Wax	"	"	24.
Yellow Six-weeks	"	"	24.
Detroit Wax	"	"	30.
Lima Wax	"	"	30.
German White Wax	"	"	30.

All ripe on 8th September.

Broad Windsor beans came up slowly but did not ripen.

Wardwell's Kidney Wax had the best pods and was the finest bean.

BEETS.

Nine varieties were sown on 23rd April. Came up well, but were killed by wind on 22nd May. Re-sown 25th May. Grew well and were lifted on 25th September.

Name of Variety.	Fit for use.	Bushels per acre.	Remarks.
Arlington Favourite Blood Turnip	July 10	1,000	Very good.
Dewar's Half-long	" 20	980	Good.
Detroit	" 2	980	Very good.
Long Smooth Blood	" 20	960	Good.
Simmer's Extra Early	" 2	880	Very good.
Columbia	" 10	780	Poor quality.
Edmund's Blood Turnip	" 10	770	Very good.
Bousecour's Market	" 20	680	"
Covent Garden	" 10	580	Small; good.

CARROTS.

Nine varieties were sown on 23rd April, but on account of dry weather were a complete failure.

CABBAGE.

Sown in hot-bed, 6th April. Transplanted into frames, 5th May. Transplanted into garden, 4th June.

Name of Variety.	Fit for use.	Weight of Heads.	Remarks.
		Lbs.	
Luxemburgh	Sept. 1..	8	Fair.
Vaughan's Allhead	Aug. 13..	14	Extra good.
Early Standard	" 10..	10	Good.
Burpee's Allhead.	" 13..	16	Extra good.
First and Best	" 13..	11	Good.
Bruce's Winter	Sept. 1..	13	"
The Lupton	Aug. 20..	8	Poor.
Brunswick Short Stem	Sept. 1..	10	Fair.
Matchless Flat Dutch	" 1..	10	Good.
Brunswick	" 1..	15	Extra good.
Fielder	" 1..	5	Poor.
Mammoth Red Rock	" 1..	3	"
Earliest Dwarf Red	" 1..	2	"
Improved Pickling	" 1..	2	"
Dwarf Early Savoy	" 1..	..	"
Lorenz's Favourite Savoy	" 1..	..	"
Brunswick Savoy	" 1..	..	"
Surehead	" 1..	10	Good.
Vandergaw	" 1..	13	Extra good.

Cabbage, sown in cold frame and transplanted direct to garden.

Seed sown in cold frame 29th April. Plants set out in garden 10th June.

Name of Variety.	Fit to use.	Weight of Head.	Remarks.
		Lbs.	
Burpee's All-head	Aug. 20..	14	Extra good.
Vaughan's First and Best	" 20..	11	"
Early Summer	" 20..	7	"

The above were just as good as the same varieties sown in hot beds, transplanted to cold frames, thence to garden and were a great deal less trouble. Only second-early varieties should, however, be grown in this way.

CAULIFLOWER.

Nine varieties were sown in hot bed on 6th April, and again on 12th April, but only about 40 plants came up. The varieties were again sown very thick in cold-frame on 29th April, and from the plants which grew one of the best crops ever raised on the farm

was produced. Autumn King was the only variety which came up in the hot bed but it is too late for the North-west Territories.

Name of Variety.	Trans-planted to Garden.	Fit for use.	Remarks.
Earliest Dwarf Erfurt	June 10	Aug. 13	Very good.
X X X Erfurt	" 10	" 13	"
Extra Early Whitehead	" 10	" 13	Large and good.
Henderson's Early Snowball	" 10	" 15	Very good.
World's Best Snowball	" 10	" 15	Good.
High Grade Dwarf Erfurt	" 10	" 13	Very good.
Gilt Edge	" 10	" 15	Good.
Autumn King	" 10	Sept. 1	Cut one head.
Selected Early Erfurt—Bruce	" 10	Aug. 15	Extra good.

CELERY.

Seven varieties were sown in hod-beds on 6th April, transplanted to cold-frame 6th May, transplanted to trenches 2nd July, and fit for use 10th September, and lifted 15th October.

Giant Pascal—very good.
Red Pascal—one of the best.
White Plume—very good.
Paris Golden Yellow—very good.
Dwarf White Golden-heart—very good.
Pink Plume—very good.
New Dwarf Red—small.

Some celery seed was also sown in the open ground but the plants did not grow to any size.

CUCUMBERS.

Eleven varieties were sown in pots in the hot-bed on 15th April, and planted out in frames in garden on 20th May.

Swan Neck—none grew.
Peerless White Spine—in use 12th July. Very fine.
Pride of Canada—none grew.
Cool and Crisp—in use 12th July. Very fine.
Giant White Perfection—none grew.
White Wonder—In use 8th July. Small, but good crop.
New Giant Pera—in use 12th July. Good crop.
Livingstone's Emerald—in use 12th July. Very fine.
White Wonder (Simmer's)—in use 8th July. Very fine.
Paris Pickling—in use 12th July. Extra good.
New Siberian—in use 1st July. Good.

These varieties were again sown on 15th May in the garden, under protection of small frames. They gave a fair crop, but were neither as early nor as prolific as those which were forced in the hot-bed.

CORN.

The following seven varieties were planted on 20th May, but on account of dry weather did not germinate until after rain on 15th June:—Ford's Sugar, Early Market, Early Cory, First of All, Minnesota, Mitchell's Extra Early and Squaw. All except Squaw, which did not grow, were fit to use on 1st September. No corn of any variety ripened during 1897.

CITRONS.

Colorado Preserving was sown 19th April, planted out on 20th May, and gave a very good crop of large citrons.

LETTUCE—2 SEEDINGS.

1st seeding, sown 27th April—fit for use 25th June.

2nd seeding, sown 1st June—fit for use through September.

Early Curled Simpson—did not make close heads, but was large and of excellent quality.

St. Louis—fine large heads.

New Asparagus—poor, long, narrow leaves.

Silver Ball—extra fine, large heads.

Denver Market—fine large heads.

Toronto Gem—fair.

MELONS.

Newport, Earliest of All and Emerald Gem musk melons were sown in pots in a hot bed on 19th April and put out in frames in the gardens on 20th May. All bore a large quantity of fruit but only four Earliest of All and one Emerald Gem ripened, quality good.

Black Spanish water-melon was sown but did not ripen.

MARROWS AND SQUASH.

Bush Marrows were sown 15th May in frames in garden and produced a large crop of small marrows.

Scallop Squash sown 15th May in frames in garden, produced a fair crop.

KALE.

Scotch and Lorenz's finest garnishing, sown in hot-bed 6th April; transplanted to cold frames 6th May; to garden 4th June. Both very fine.

BRUSSEL'S SPROUTS.

New Giant and Improved Exhibition sown 6th April. Transplanted 6th May. Did not do well.

ONIONS—Sown in Hot-bed and Transplanted.

Name of Variety.	Sown in Hot-bed.	Trans-planted in Garden.	Taken up.	Bushels per Acre.	Remarks.
Red Victor	April 6	June 7	Sept. 16	480	Very large.
Prize Taker	" 6	" 7	" 16	440	Early; fine shape.
Yellow Dutch Setts	" 16	" 7	" 16	440	Very large.
Red Globe	" 6	" 7	" 16	400	Large and coarse.
Large Yellow Danvers	" 6	" 7	" 16	380	Extra fine.
White Globe	" 6	" 7	" 16	320	"
Red Globe (Exp. Farm seed)	" 6	" 7	" 16	320	Very large.

The above were much larger than the same varieties sown in the open ground but they did not ripen as well nor will they keep as long.

ONIONS.—Sown in the open ground.

Name of Variety.	Sown.	Taken up.	Bushels per Acre.	Remarks.
Large Yellow Danvers	April 16	Sept. 16	380	Very fine.
World-beater Wethersfield	" 16	" 16	360	"
Red Globe	" 16	" 16	280	"
Large Red Wethersfield	" 16	" 16	280	"
Red Globe (Ex. Farm seed)	" 16	" 16	240	"
White Globe	" 16	" 16	200	"
New Queen	" 16	" 16	180	Extra fine pickling
White Silver Skin	" 16	" 16	100	"

The above were rather small but were of excellent quality and ripened well. One bed of Large Red Wethersfield sown the fall of 1896, came up on the same day as those sown in the spring and no difference could be seen between them all season.

PEASE.

Ten varieties were sown on 24th April, and nine varieties on 5th May. With the exception of a few feet on one end of each row of those sown on 24th April, none came up till after rain on 15th June. The crop was consequently very late.

Name of Variety.	Sown.	Fit for use.	Ripe.	Remarks.
Wm. Hurst	April 24	July 12	Aug. 31	Extra good.
Daisy	" 24	" 24	Sept. 10	One of the best.
American Wonder	" 24	" 12	Aug. 31	Good.
Laxton's Alpha	" 24	" 12	" 31	"
Eclipse	" 24	" 10	" 31	"
Shropshire Hero	" 24	" 24	Sept. 10	" but late.
Yorkshire Hero	" 24	" 24	" 10	" "
Telephone	" 24	" 24	" 10	Extra good; large pods.
Stratagem	" 24	" 20	" 10	"
Heroine	" 24	" 24	" 10	Large and prolific.
New Queen	May 5	" 24	" 10	Good; late variety.
Alaska	" 5	" 12	Aug. 31	Early; small.
Nott's Excelsior	" 5	" 12	" 31	Good.
Horsford's Market Garden	" 5	Aug. 10	....	Did not ripen; very prolific.
Burpee's Profusion	" 5	" 10	....	" "
S. B. M. Extra Early	" 5	July 12	Aug. 31	Small.
Little Giant	" 5	" 12	" 31	Extra good.
Champion of England	" 5	Aug. 30	....	Did not ripen.
C.P.R.	" 5	Sept. 1	....	Frozen; too late.

PUMPKINS.

Connecticut Field, Jumbo and Prize were sown on 15th May. Protected by boxes, provided with light 12 x 12 glass. Connecticut Field was very fine; of good size and all ripened. Jumbo and Prize were larger but did not quite mature.

PARSNIPS.

Magnum Bonum, Hollow Crown and New Intermediate were sown 17th April. All came up well but the crop was poor and the roots very small.

RADISHES.

Nine varieties were sown on 27th April. All came up well but were frozen down. Resown 10th May, and again on 1st June. All were fit to use six weeks after seeding.

Olive Gem ; good.
Rosy Gem ; good.
In & Out ; very good ; ready in 40 days.
Early Eclipse ; poor crop.
Ne plus ultra ; poor crop.
Long White Vienna ; good.
Scarlet Turnip ; poor.
Earliest White ; poor.
Colorado Glass ; extra good.

RHUBARB.

The old beds of Linnæus, Victoria and Tottle's Improved did well, but some of the plants have died although all the crowns were sprayed with Bordeaux mixture. A new bed 2 years old of Victoria and Large Green made a strong growth.

PEPPERS.

Sweet Spanish and Red Bell were sown. Both set a good crop, but did not ripen.

HERBS.

Moss Curled Parsley, Sage, Summer Savory and Borage were sown on 26th April, and all did well.

EGG PLANTS.

Early Purple and White Pearl were sown. The former had two to four good sized fruits on each plant. White Pearl did not set any fruit.

TOMATOES.

Seven varieties were tested and all did well except Livingstone's Honor-Bright, which never seemed healthy. All the others bore a large crop of ripe fruit before frozen. The night before frost came, the vines were covered with frames and a further crop of ripe fruit was the result.

Name of Variety.	Sown.	Potted.	Trans-planted.	Ripe.	Remarks.
Canada	April 5..	May 17..	June 9..	Sept. 1..	Extra fine, late.
Imperial	" 5..	" 17..	" 9..	" 1..	" "
Earliest of All	" 5..	" 17..	" 9..	Aug. 7..	Fair, early.
Early Atlantic	" 5..	" 17..	" 9..	" 20..	Extra fine.
Everbearing	" 5..	" 17..	" 9..	" 25..	Prolific.
Yellow Plum	" 5..	" 17.	" 9..	" 21..	Fine.
Honor-Bright	" 5..	" 17..	" 9..	Sept. 1..	Poor crop.

TOBACCO.

Sown in hot-bed, 20th April; planted out, 4th June. Suckers and flower-buds were trimmed off. Cut 9th September, and seemed fairly well matured.

FLOWER GARDEN.

As in preceding years as many varieties as possible were tested. On the whole the season was not favourable for the culture of flowers and many varieties did not do as well as formerly.

ANNUALS.

Grown in hot-bed and transplanted.

Name of Variety.	Sown in Hot-bed.	Trans-planted to Garden.	In bloom. From	In bloom. Till	Remarks.
Asters, 10 varieties	April 6	June 23	Aug. 20	Sept. 9	Very poor this year.
Carnation Marguerite	" 6	" 23	Sept. 1	Frozen	Good show.
Dianthus, 10 varieties	" 6	" 23	Aug. 1	"	Extra fine.
Stocks, 4 "	" 6	" 23	July 24	"	Flowers fair.
Pansies, 12 "	" 6	" 23	" 24	Nov'r	Did well.
Antirrhinum	" 6	" 23	Aug. 10	Frozen	Good show.
Petunia, Double	" 6	" 23	" 10	"	Very few double.
Verbena	" 6	" 23	" 10	"	Good.
Brachycome	" 6	" 23	" 10	"	Showy.
Amaranthus	" 6	" 23	" 10	"	Only one plant. Fine.
Linum Scarlet	" 6	" 23	" 10	"	Good show.
Calliopsis	" 6	" 23	" 10	"	Very poor.
Zinnia Elegans	" 6	" 23	" 10	"	Extra fine.
Phlox Drummondi	" 6	" 23	" 10	"	Good show.
Sunflower, Double	" 6	" 8	" 1	"	Very fine.
Marigold, Eldorado	" 6	" 20	" 1	"	"
Nicotiana Affinis	" 6	" 20	" 1	"	Very fine, morning and evening but does not look well during the day.

ANNUALS SOWN IN THE OPEN GROUND.

Sweet Pea—Eckford's finest, sown 17th April; came up and grew well until heavy rains in June, when more than one-half the plants died; the remainder flowered well until frozen. Eight varieties were sown on 20th April, and all did well.

Dwarf Nastartium—Sown 17th May. Made a good border and flowered freely until frozen.

Sweet Alyssum—Sown 17th May. Flowered freely all season.

Escholtzia—Sown 17th May. Did well; in flower all season. One of the best hardy annuals.

Phlox Drummondii—Sown 17th May; in bloom 1st July. Made a good show all season.

Candytuft—Sown 1st May. Did not do as well as in former years.

Mignonette—Four kinds were sown on 17th May. All did extra well.

Poppy—Sown 17th May. Made a good show.

Godetia—Sown 25th May. Made a good show all season.

Salpiglossis—Sown 25th May. Late in flowering, but flowers were very fine.

Convolvulus Minor—Sown 17th May. Made good bed.

Japanese Morning Glory—Sown 17th May. Made good growth of vine, but did not flower.

Larkspur—Sown 17th May. Flowers very fine, but late.

PERENNIALS.

Pæony—In bloom 20th June ; very fine.

Scarlet Lychnis—In bloom 5th June ; made a good show.

Veronica—Did not blossom.

Yellow Flax—Very fine ; one of the best perennials.

Platycodon grandiflora—White and blue. In bloom 1st July ; very fine.

Rudbeckia—Golden Glow—Very strong grower ; made a good show.

Sweet William—In bloom 5th June ; one of the best.

Columbine—In bloom 1st June ; very fine.

Delphinium grandiflorum—In bloom 1st June ; very fine.

Garden Pink—Did not do well.

Everlasting Pea—Did not do well.

Iceland Poppy—In bloom 24th May ; very showy.

Perennial Flax—Did not do as well as usual.

Spiræa Ulmaria, *Filipendula* and *Palmata Elegans*—All very fine.

BULBS.

Tulips—A large collection planted last fall did well this year. They were in bloom from 20th May to 20th June. Thirty-two varieties, 16 bulbs each, were planted this autumn.

Crocuses—A number were planted last fall but did not bloom this year. More were planted this season.

Hyacinths—Planted in garden last fall ; all died. Potted in house ; did well.

Narcissus—Four varieties planted last fall. Did not flower this year. Three varieties were planted this autumn for further test.

Scilla sibirica—Planted fall 1896 ; did well ; in bloom 1st May. Forty more were planted this season.

Scilla bifolia—Planted fall 1896 ; did not do well. Twenty more were planted this autumn.

Lilies—Four Lilium Candidissima were planted last fall and lived through the winter, but did not flower.

Iris—A large number of different varieties of Iris planted last fall lived through the winter and did well this season. A further supply was received and planted this autumn.

Hemerocallis—Three varieties were planted last fall, and again this spring, but the plants have not done well.

FRUIT TREES AND BUSHES.

The past season was very unfavourable for any kind of small fruit with the exception of currants.

Native fruits were almost an entire failure in many districts, while in others a fair crop was produced.

Lists are submitted giving details of the growth and fruiting of all varieties of large and small fruits growing on the Indian Head Experimental Farm.

APPLES.

A few trees of the berried crab (Pyrus baccata) blossomed, but the frost in May destroyed them ; and there was no fruit.

PYRUS PLANTED, 1896.

In the following list will be found particulars of the condition of the different varities of Pyrus planted in the spring of 1896 :—

RECEIVED from Central Experimental Farm Ottawa.

Name of Variety.	Number planted, Spring 1896.	Number living, Fall 1897.	Notes on Growth.	
Pyrus Baccata Edulis	4	4	Strong growth.	
" Sanguinea	8	7	"	
" Flava	1	1	"	
" Conocarpa	1	1	"	
" Macrocarpa	3	2	"	1 died, 1896.
" Aurantiaca	2	2	"	
" Cerasiformis	7	6	"	"
" Lutea Regel	2	1	"	"
" Genuina	5	5	"	
Pyrus Prunifolia	4	4	"	
" Xanthocarpa	4	4	"	
" Intermedia	4	4	"	
Pyrus Alnifolia	5	5	"	
" Spuria	4	0	4 died, winter 1896-97.	
" Intermedia	4	0	"	"
Seedlings raised at Indian Head.				
Pyrus Prunifolia	19	19	Strong growth.	
" Baccata Macrocarpa	8	8	"	
" " Genuina	8	8	"	
" " Cerasiformis	13	13	"	
" " Sanguinea	5	5	"	

SEEDLING PLUM AND PYRUS ORCHARD, 1897

An orchard containing four plots each 210 x 250 feet has been this year laid out west of the superintendent's house.

Plot No. 1 is partially planted as follows :—

Row 1.—4 Pyrus prunifolia.
" 1.—16 " baccata yellow.
" 2, 3, 4, 5 and 6.—96 Pyrus baccata yellow.
" 7, 8.—40 seedlings of Siberian crab.

Leaving 16 rows vacant.

PLOT NO. 2.

Row 1, 2, 3, 4, 5 and 6.—120 seedlings of native plums.
" 7, 8, 9, 10, 11.—100 seedlings of Hungarian plum.
" 12.—20 seedlings of Speer plum.
" 13, 14, 15, 16, 17.—100 seedlings of Weaver plum.
" 18, 19, 20, 21.—80 seedlings of De Soto plum.
" 22.—20 seedlings of Yosemite yellow "
" 23.—20 seedlings of Ida plum.
" 24.—20 seedlings of seedling No. 3 plum.

PLOT NO. 3.

Row 1, 2.—40 seedlings of Speer plum.
" 3, 4.—40 " " Wolf "
" 5, 6.—40 " " Purple Yosemite plum.
" 7, 8.—40 " " Van Buren plum.
" 9, 10.—40 " " Hungarian "
" 11, 12.—40 " " Weaver "
" 13, 14.—40 " " American "
" 15.—20 " " Yosemite Yellow plum.
" 16.—20 " " Cheney plum.
" 17.—20 " " Rollingston plum.
" 18, 19, 20.—60 seedlings of Ida plum.
" 21, 22, 23.—60 " " De Soto plum.
" 24.—20 seedlings of Voronesh plum.

PLOT NO. 4.

Rows 1 to 24.—Vacant.

Eighty-five per cent of the above have lived and made fair to strong growth and are in good condition for the winter. In the spring of 1898 some of the blanks will be filled with new varieties of crosses between Pyrus baccata and some of the larger varieties of apples which have been recently originated at Ottawa.

Plots No. 1 and 2 are inclosed by a hedge of seedling *Lilacs* raised from seed of *Syringa Vulgaris Chas. X.*, 18 inches high, set out 3 feet apart. Plots No. 3 and 4 by seedlings of *Caragana Arborescens*, 18 inches high, planted 30 inches apart.

These plantations when completely filled will accommodate 1,920 trees.

PLUMS.

Seedlings of Weaver.—Eighty trees were planted in the spring of 1894. Sixty-eight were living in the autumn of 1897. These have made a strong growth and appear to be hardy. One tree bore three plums this year, but they did not ripen.

Seedlings of Hungarian.—Twenty of these were planted in the spring of 1894. Five were living in the autumn of 1897. They have made strong growth and appear to be hardy. No fruit has yet been borne on any of this variety, but the trees were covered with blossoms this year; which were however frozen in May.

Seedlings of Speer.—Four of these were planted in the spring of 1895 and were all living in the autumn of 1897. They have made strong growth and appear to be hardy, but have not yet borne fruit.

Seedlings of De Soto.—Eight were planted in the spring of 1895, and 6 were living in the autumn of 1897. They have made a strong growth and seem hardy, but have as yet borne no fruit.

Seedlings of Voronesh.—Four of these were planted in the spring of 1897, and 4 were living in the autumn. They have made strong growth.

Seedlings of Imperial Blue.—Five were planted in the spring of 1895, and one was living in the autumn of 1897. This has made strong growth, but this variety does not seem sufficiently hardy to stand the climate here.

PLUMS FROM CHAS. LUEDLOFF, COLOGNE, MINN.

In the spring of 1896, 38 varieties of plums were ordered by the Director from the above nursery and when received they were planted in an inclosure. In the following list will be found the names, number planted and notes on the condition of the trees in the fall of 1897.

Name of Variety.	Number Planted.	Notes on Condition and Growth, 1897.
Purple Yosemite	2	Strong growth.
Clinton	2	1 fair growth, 1 dead.
Missouri Apricot	2	2 fair growth.
Deep Creek	2	2 strong growth.
Irene	2	2 fair growth ; kills back.
Milton	2	1 strong growth, 1 dead.
Anthony	2	2 "
Cottrell	2	2 fair growth.
Emerson	2	2 strong growth.
Weaver	2	2 fair growth ; partly winter killed.
Van Buren	2	2 "
Reed	2	2 " partly winter killed.
Esther	2	1 " 1 strong growth.
Forest Rose	2	2 " partly winter killed.
Dr. Dennis	2	2 " "
New William	2	2 "
Newman	2	2 strong growth.
Van Deman	2	2 "
Yellow Sweet	2	1 fair growth, 1 strong growth.
Chas. Downing	2	1 " "
Ocheeda	2	2 strong growth.
Speer	2	1 " 1 dead.
American Eagle	2	2 fair growth.
Col. Wilder	2	2 "
Pepper's Puritan	2	2 "
Dunlop No. 1	2	1 strong growth, 1 broken.
Wood	2	1 " 1 dead.
Illinois Iron-clad	2	1 fair growth, 1 dead.
Crescent City	2	2 strong growth.
Large Red Sweet	2	2 "
Hammer	2	1 " 1 fair growth.
Silas Wilson	2	2 "
City	2	2 fair growth.
Richland	2	1 " 1 dead.
Gaylord	2	1 " "
Moldavka	2	2 "
Neil's	2	1 " "
Hawkeye	2	2 "

PLUMS FROM THE CENTRAL EXPERIMENTAL FARM, OTTAWA, PLANTED 1897.

De Soto	2	
Aikin	1	
Hoskin	1	

MANITOBA NATIVE PLUM.

Planted 1895, and grown from seed planted on this farm.

Three trees grown from seed planted on the Experimental Farm, Indian Head, bore fruit this season. The crop was not large but the fruit was of fair size and quality.

The following trees (from Stonewall, Man.) were planted in 1895. These have not yet borne fruit, but those living will probably do so in 1898 :—

Variety No.	No. Planted.	Notes on Growth, 1897.
No. 69	2	1 strong growth, 1 dead.
" 27	3	2 " 1 "
" 7	2	2 fair growth.
" 12	1	Dead.
" 32	1	"
" 29	2	1 strong growth, 1 weak growth.
" 47	3	1 " 2 dead.
" 59	1	1 "
" 63	1	1 "
" 23	1	Dead.
" 53	1	1 strong growth.
" 22	2	1 fair growth, 1 dead.
" 84	2	1 strong growth, 1 dead.
" 64	2	2 strong growth.
" 46	2	2 dead.
" 31	2	2 strong growth.
" 21	3	2 " 1 dead.
" 94	1	Dead.
" 14	1	"
" 52	1	"
" 36	3	2 strong growth, 1 dead.
" 15	1	1 fair growth.
" 27	1	Dead.
" 63	1	"
" 88	1	Strong growth.
" 79	1	Dead.
" 12	1	"
" 11	1	"
" 91	2	2 strong growth.
" 65	2	"
" 71	1	Dead.
" 56	2	1 fair growth, 1 dead.
" 67	2	2 strong growth.
" 26	2	1 strong growth, 1 dead.
" 69	1	1 "
" 40	1	1 "
" 51	1	1 "
" 30	2	1 " 1 dead.
" 61	2	1 " 1 "
" 86	1	1 "
" 85	1	1 "
" 89	2	2 "
" 57	2	2 "
" 76	2	2 dead.
" 81	1	1 strong growth.
" 41	1	1 "
" 68	2	2 "
" 39	1	1 "
" 67	2	2 "

CHERRIES.

Mahaleb.—One tree planted, 1897. Fair growth.

Seedlings of Carnation.—Five were planted in the spring of 1894, and one was living in the autumn of 1897. This tree has made fair growth.

Seedlings of Lithauer Weichsel.—Twenty of these were planted in the spring of 1894, and six were living in the autumn of 1897. These have made fair growth.

Seedlings of Olivet.—Four were planted in the spring of 1895, and all have since died.

Seedlings of Minnesota Ostheim.—Thirty-five of these were planted in the spring of 1895, and 11 were living in the autumn of 1897. These have made strong growth.

Rocky Mountain Cherry.—Fourteen were planted in the spring of 1895, and 12 were living in the autumn of 1897. Some of these fruited this year and made strong growth. The fruit was good.

Wild Cherry from Nebraska.—Four of these were planted in the spring of 1896, and 3 were living in the autumn of 1897. They appear to be hardy and have made strong growth.

Sand Cherry.—One hundred and eighty were planted in the spring of 1894, 168 are now living. These appear to be hardy and have made strong growth and 12 of them have borne fruit.

APRICOTS.

Two Apricots from Turkestan were planted last spring and have made fair growth.

PEARS.

One Longworth pear was planted last season and has made fair progress.

GRAPES.

Gibb.—Five were planted in the spring of 1895. All are living but have made slow growth.

Bacchus.—Five were planted in the spring of 1895. All are living and have made fair growth.

Manitoba Native Wild Grape.—Three were planted in the spring of 1895. All are living and have made strong growth, but none of them have yet borne fruit.

SMALL FRUITS.

The currants planted previous to 1896; both white and red produced a good crop last season, but the black currants were small and the crop light.

White.

White Grape,	3 planted,	1896;	fair growth,	no fruit.
White Imperial,	3 "	1897	"	"

Red.

PLANTED, 1896.

Raby Castle,	3 trees;	strong	growth,	few berries.
Victoria,	3 "	fair	"	no fruit.
Red Dutch,	2 "	"	"	few berries.
Versillaise,	4 "	"	"	very large, fine.
Fertile d'Angers,	3 "	weak	"	no fruit.
Fay's Prolific,	2 "	fair	"	very fine.
Cherry,	4 "	"	"	few good bunches.
Prince Albert,	3 "	strong	"	"
Red Dutch,	4 "	"	"	"
2/2	4 "	"	"	no fruit.
Dakota Tree Currant,	2 "	"	"	no fruit.

Section of part of shelter belt chiefly Box-elder, eight years planted, 100 feet wide, extending about $1\frac{3}{4}$ mile along west and north boundaries of Experimental Farm, Indian Head, N.W.T.

Shelter belt of Aspen or Tremulous Poplar, *Populus tremuloides*, at the Experimental Farm at Indian Head, N.W.T., nine years planted.

PLANTED, 1897.

North Star,	3	trees;	strong	growth.
Pomona,	3	"	fair	"

BLACK CURRANTS, PLANTED, 1896.

Lewis,	3	trees;	fair	growth,	no fruit.
Oxford,	2	"	"	"	"
Winona,	3	"	strong	"	few fair berries.
Perth,	1	"	weak	"	no fruit.
Ethel	4	"	strong	"	"
Eclipse,	4	"	"	"	few on one bush.
Kerry,	3	"	"	"	no fruit.
Madoc,	3	"	fair	"	"
Star,	4	"	"	"	"
Sterling,	4	"	strong	"	1 bush good crop, 3 none
Orton,	4	"	"	"	no fruit.
Standard,	3	"	"	"	few berries.
Perry,	3	"	"	"	no fruit.
Eagle,	4	"	fair	"	1 bush good fruit, 3 none.
Monarch,	4	"	"	"	no fruit.
Charmer,	4	"	strong	"	few good berries.
Beauty,	4	"	"	"	fair crop, fine fruit.
Ontario,	4	"	"	"	a few berries.
Stewart,	4	"	"	"	no fruit.
Clipper,	4	"	"	"	small crop, fair size.
Climax,	4	"	"	"	no fruit.
Star,	4	"	"	"	a few good berries.

PLANTED 1897.

Victoria,	3	trees;	weak	growth.
Crandall,	3	"	strong	"

RASPBERRIES.

Planted 1893.

Dr. Reider.—Fair crop fine flavoured berries.
Philadelphia.—Small crop.
Turner.—Fair crop of small berries.
Caroline.—Winter killed. No fruit.
Golden Queen.—Winter killed. No fruit.

Planted, Spring 1897.

Garfield	6	planted.—	3 dead, 3 strong growth.
Craig	8	"	8 fair growth.
Muriel	6	"	1 dead, 5 fair growth.
Percy	2	"	2 dead.
Caroline	2	"	1 dead, 1 strong growth.
Lady Ann	3	"	3 fair growth.
Sir John	2	"	1 dead, 1 strong growth.
Sharpe	6	"	5 " 1 fair growth.
R. B. Whyte	2	"	2 "

Empire	3 planted.—	2 dead,	1 fair growth.	
Carleton	2 "	2 "		
Sarah	12 "	10 "	2 "	"
Miller	6 "	3 "	3 "	"
Kenyon	12 "	9 "	3 "	"

Saunders' Large Red 2 planted 1 dead, 1 weak growth.

BLACK AND PURPLE CAP RASPBERRIES.

Planted 1893.

Schaffers' Colossal and Early Ohio bore fruit. Berries small and of medium quality.

Planted 1897.

12 Older.—All dead, fall 1897.
12 Progress.— " " "
1 Charles.—Fair growth.
1 Royal.— " "

GOOSEBERRIES.

Planted 1893.

Smith's Improved	45 trees	planted,	38	living.	Fair crop.
Lancashire Lad	2 "	"	1	"	" "
Governess	2 "	"	1	"	No fruit.
Columbus	2 "	"	2	"	Few, very large.
Houghton	25 "	"	23	"	Fair crop.
Native	5 "	"	2	"	Small.

Planted 1897.

Golden Prolific	3 planted,	2 dead, 1 weak growth.
Red Jacket	3 "	3 "
Keepsake	3 "	3 weak growth.
Pearl	4 "	2 dead, 2 weak growth.

STRAWBERRIES.

Planted 1895.

Windsor Chief, New Dominion and Pine Apple bore a small crop of poor fruit.

Planted 1896.

13 Mitchell's Early	All dead, spring 1897.
13 Timbrell	" " "
13 Hilton Gem	" " "
13 Brandywine	" " "
12 Mrs. Cleveland	" " "
13 Marshall	2 living, spring 1897.

Planted 1897.

On 15th August the following plants were received from the Central Experimental Farm, Ottawa, and planted in cold frame. In spring of 1898 they will be set out in beds in garden.

25 Scarlet Queen.
25 Brandywine.
25 Gem, P.
25 Paris King.
25 Wm. Belt.
25 H. W. Becher.
20 Alpine No. 5.

FOREST TREES.

Since tree culture on the farm commenced, trees have never made more satisfactory progress than during the past season.

The spring being unfavourable for early growth, no set backs in the way of April or May frosts were encountered, and the trees, when the growth did start, made excellent progress during the entire season. Single trees, hedges and wind breaks all did well, and only one tree was lost on the avenues of the farm.

Among the trees transplanted last spring, losses occurred with the Norway Spruce. A good many were transplanted during the second week of May when the weather was dry and windy, and after that date and on 21st and 22nd May a strong wind-storm which lasted for 48 hours killed all that had not become firmly rooted.

The planting of hedges around fields for protection from winds was continued last spring. Those set out in 1896 have done very well. Next spring planting will complete the hedges around every field on the farm with the exception of the pasture inclosure. The trees used for this purpose are principally native maple (*Acer negundo*) 2 or 3 years old.

In the spring of 1895, five one-half acre plots of trees were planted at different distances apart, for the purpose of ascertaining the cost of planting and keeping clean and in a thriving condition until the trees shade the ground sufficiently to prevent the growth of weeds, and hence need no further cultivation. These trees were planted as follows:—

	Plot No.	1.	Box Elder.	Set out $2\frac{1}{2}$	feet apart each way.
	"	2	"	" 3	"
	"	3	"	" $3\frac{1}{2}$	"
	"	4	"	" 4	"
and	"	5	Green Ash	" $2\frac{1}{2}$	"

In addition to these were

Plot No. 6. $\frac{1}{2}$ acre Box Elder seed, sown in rows $2\frac{1}{2}$ feet apart, and plot No. 7, $\frac{1}{2}$ acre Green Ash seed, sown in rows $2\frac{1}{2}$ feet apart.

Following will be found the cost of taking care of these trees for the 1st, 2nd and 3rd years.

Plot No. 1.—$\frac{1}{2}$ Acre.

1st year cost of planting,	15	hours	$2 25
" scruffling, etc.,	12	"	1 80
2nd year "	10	"	1 50
3rd year "	6	"	0 90
			$6 45

Plot No. 2.—$\frac{1}{2}$ Acre.

1st year cost of planting,	12	hours	$1 80
" scruffling, etc.,	15	"	2 25
2nd year "	13	"	1 95
3rd year "	5	"	0 75
			$6 75

Plot No. 3.—$\frac{1}{2}$ Acre.

1st year cost of planting,	9	hours	$1 35
" scruffling, etc.,	11	"	1 65
2nd year "	12	"	1 80
3rd year "	4	"	0 60
			$5 40

PLOT NO. 4.—½ ACRE.

1st year cost of planting,	9	hours	$1 35
" scruffling, etc.,	10	"	1 50
2nd year "	14	"	2 10
3rd year "	3	"	0 45
			$5 40

PLOT NO. 5.—½ ACRE.

1st year cost of planting,	18	hours	$2 50
" scruffling, etc.,	11	"	1 65
2nd year "	9	"	1 35
3rd year "	5	"	0 75
			$6 25

PLOT NO. 6.—½ ACRE.

1st year cost of making drills,	2	hours	$0 30
" " sowing seed	4	"	0 60
" " covering seed	6	"	0 90
" scruffling, etc.,	11½	"	1 72
2nd year "	10	"	1 50
3rd year "	5	"	0 75
			$5 77

PLOT NO. 7.—½ ACRE.

1st year cost of making drills,	2	hours	$0 30
" " sowing seed,	4	"	0 60
" " covering seed,	6	"	0 90
" scruffling, etc.,	10½	"	1 57
2nd year "	9½	"	1 42
3rd year "	12	"	1 80
			$6 59
Taking up trees for five plots,	22½	hours	$3 38

Plots No. 1 and 2 will require little or no work in future as the trees, especially in plot No. 1 entirely shade the grounds.

Plots No. 3 and 4 will require two years further growth and care to place them in the same position. Plot No. 5 although planted only 2½ feet apart each way, being ash which is of slower growth, is very far behind the box elder in the matter of shade.

Next spring it is proposed to continue this work and mix the plantations with ground shading varieties of trees such as sand cherry.

ARBORETUM.

The arboretum now contains 173 species and varieties of trees and shrubs which have been planted as follows:—In 1895, 41 varieties; in 1896, 65 varieties 6 of which replace deaths of 1895; and in 1897, 75 varieties, two of which replace deaths of 1896.

The varieties added in 1897 are:—

Acer monspessulanum.
" dasycarpum.
" saccharinum (from Minnesota).
" spicatum.
Arbor vitæ. Meehan's Golden.
Berberis ilicifolia.
" vulgaris.
" Asiatica.
" vulgaris violacea.
Betula dahurica.
" populifolia.
" pendula youngii.
Cornus white-leaved.
" sanguinea.
" sibirica variegata.
" sanguinea variegata.
" sericea.
Cytisus hirsutus.
" trifolium.
" purpureus.
Celtis occidentalis.
Cratægus sanguinea.
" sibirica.
" coccinea.
" edulis.
Deutzia ?
Diervilla Lutea.
Euonymus Americana.
Fraxinus Lutea.
" Berlanderiana.
" quadrangulata.
Gleditschia triacanthos.
Hydrangea paniculata grandiflora.
Juniperus Virginiana.
Lonicera sibirica.
" phylomela.
Ligustrum Stauntoni.
Populus Bolleana.
" Argentea.
Pinus Montana.
" ponderosa.
Ptelea trifoliata aurea.
Philadelphus Deutziflorus.
" coronarius.
" inodorus.
Ribes Gordonianum.
Rhus coriaria.
Spiræa callosa superba.
" bumalda.
" callosa alba.
" ulmifolia.
" variegata.
" Van Houttei.
" callosa rosea.
" Billardi rosea.
" Billardi alba.
Sorbus domestica.
Sambucus heterophyllus.
" variegata argentea.
" nigra.
" canadensis.
" variegata aurea.
" aurea nova.
Syringa purpurea.
" Emodi variegata.
Salix Villarsiana.
" aurea pendula.
" Salamoni.
" alba.
" purpurea pendula.
" capræa.
Thuya, Hoveyi Golden.
Tilia americana.
Ulmus sibirica.
Viburnum lantana.

SAMPLE HEDGES.

Ten varieties of trees and shrubs were, this spring, added to the list of sample hedges, viz.:—

Rhamnus frangula.
Lonicera grandiflora.
Rosa rubrifòlia.
Salix voronesh.
Salix Laurifolia.
Cotoneaster vulgaris.
Seedling plum (native).
Picea pungens.
Betula papyrifera.
Betula lutea.

The two latter were killed by drought but the others have made satisfactory progress and are in good condition for winter.

Of the hedges set out in 1895 and 1896, Salix acutifolia, Populus monilifera, Acer ginnala, Caragana arborescens, Artemisia abrotanum var. Tob. and Negundo aceroides continue to do well and to these may be added Syringa vulgaris, Populus balsamifera, Elæagnus angustifolia and Symphoricarpus racemosus.

TREES AND SHRUBS PLANTED 1897.

The following trees and shrubs were received in May from the Central Experimental Farm, Ottawa, and planted in nursery rows.

300 Acer ginnala.
20 American hornbeam.
22 Betula populifolia.
30 Acer spicatum.
10 Betula rubra.
2 Enonymus Americana.
18 Populus fastigiata.
15 Acer saccharinum.
8 Celtis occidentalis.
2 Cornus white-leaved.
1 Salix regalis.
1 Populus frigilea.
4 Acer saccharinum, No. 2 (Minn.)
9 Eleagnus angustifolia.
1 Thuya pumila.
2 Arbor-vitæ. Douglas Golden.
2 Juniperius virginiana.
7 Abies balsamea.
1 Rhus coriaria.
11 Celastrus scandens.

ROSES.

In May, 12 varieties of roses were received from the Central Experimental Farm, Ottawa, and planted in one of the garden inclosures.

Following will be found a list of varieties and notes on their progress during the past season :

Mashall P. Wilder—Grew well and flowered.
Mme. Marie Rady—Died.
Merveille de Lyon—Strong growth, flowered.

Baron Prevost—	do	flowered profusely.
Caroline de Sansal	do	did not flower.
François Levet	do	flowered.
Lady Helen Stewart	do	do
Crimson Rambler	do	did not flower.
Mme. Victor Verdier	do	do
Mme. Plantier	do	do
Mme. Geo. Bruant	do	flowered.
Mme. Gabriel Luizet	do	do

This fall the plants were surrounded by frames and covered with 8 or 10 inches of dry leaves, which it is hoped will afford sufficient protection during the winter.

LIVE STOCK—CATTLE.

At present the herd consists of fifty-one animals, as follows :—

Shorthorns—2 males, 6 females.
Holsteins—4 males, 11 females.
Polled Angus—1 female.
Ayrshire—1 male.
Grades—5 cows, 5 heifers and 16 steers.

In grade steers, are included 10 animals recently purchased for use in feeding tests to be carried on during the winter of 1897-98.

All the animals are in good condition and apparently healthy.

FEEDING TEST.

Twelve head were divided into three lots of four each and fed from 1st December, 1896, to 31st March 1897. The lots consisted of eleven 2½ year old steers and one cow; the twelfth steer not being procurable at the time the test commenced.

Lot No. 1 was fed wheat-chaff.

Lot No. 2 was fed cut oat sheaves, and

Lot No. 3 was fed cut Brome hay.

To each of the animals fed as above was given the same ration of meal and ensilage. The rations were in the proportion of 2 pounds ensilage to each pound of dry fodder, and 6 pounds of meal per day (consisting of ground barley, 2 parts, ground wheat, 1 part) to each animal for the first two months of the test.—During the last two months each animal received 8 instead of 6 pounds of meal per day. The animals were fed three times a day and were fed for two weeks on a uniform ration before the test commenced.

Appended will be found the monthly and total gains of each lot:—

Lot.	Principal ration.	December.	January.	February.	March.	Total.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs
Lot No. 1....	Wheat-chaff...........	324	264	211	226	1,025
" 2....	Oat sheaves...........	235	262	248	165	910
" 3....	Brome hay.............	320	277	290	128	1,015

It will be noticed that the principal gains were made during the first two months when only 6 pounds of meal was fed per day to each animal.

Lot No. 2 did not do as well as Lots Nos. 1 and 3.

PROFIT IN FEEDING STEERS.

Six of the eleven steers used in this feeding test were purchased in the fall of 1896 and sold 5th May, 1897.

Weight when Purchased.	At	$ cts.	Weight when Sold.	Less Shrinkage	Net Weight.	At	$ cts.
6,260.....	$ 2 00	125 20	7,770........	388½	7,381½	$ 3 60	265 72
Net gain............	....	140 52	....	....	....	....	.. ..
		265 72					265 72

Or a net gain per animal of $23.43 from which must be deducted the cost of feed and labour.

Five steers bred on Experimental Farm, when sold realized as follows:—

Weight December 1st.	Weight when Sold.	Less Shrinkage	Net Weight.	At	$ cts.
5,035 Lbs. or 43\frac{65}{100}$ for each animal.............	6,295	314¾	5,980¼	$ 3 60	215 28

SWINE.

The herd on the farm at present consists of 42 animals as follows:—

Chester White	1	Boar.
Berkshire	2	" 2 sows.
Large Yorkshire	4	" 3 barrows, 8 sows.
Tamworth	8	" 9 sows.
Grades (Berkshire)	2	Barrows, 3 sows.

Since my last report, 1 Berkshire boar, 1 Large Yorkshire boar, 3 Large Yorkshire sows, 4 Tamworth sows and 2 Berkshire sows have been sold to farmers.

POULTRY.

Four breeds are kept, Barred Plymouth Rocks, White Wyandottes, White Leghorns and Black Minorcas. The breeding pens were made up on 15th March, and eggs were gathered as follows:—

Breed.	2 wks. — Mch.	April.	May.	June.	July.	Aug.	Sept.	3 wks. — Oct.	Total.
Plymouth Rock	10	118	65	22	41	31	40	34	361
White Wyandotte	21	89	71	24	38	44	30	34	351
White Leghorn	24	126	89	59	51	48	55	35	487
Black Minorca	50	122	92	49	44	63	50	33	503

The hens were all allowed to run together after 20th October.

Twelve cockerels and twenty settings of eggs were sold to farmers during the year.

THE FLOCK NOW CONSISTS OF

Breed.	Cocks.	Hens.	Pullets.	Total.
Plymouth Rock	8	8	9	25
White Wyandotte	10	12	7	29
White Leghorn	14	11	14	39
Black Minorca	3	9	4	16

BEES.

As stated in my last report two hives of bees were last fall packed in chaff and put away in a room over the poultry house. Both swarms were dead when the hives were opened in the spring allthough a large quantity of honey was found in each.

In May last, one hive was obtained from Mr. S. A. Bedford, Superintendent, Experimental Farm, Brandon. From this three swarms have been secured. The first on 16th July; the second on 26th July, and the third on 28th July. The last swarm having lost its queen was put in with its predecessor. The three colonies had respectively 46, 44 and 47 pounds of honey when put away for the winter. No honey was taken from any of the colonies during the season as at no time was a hive filled. The bees worked principally on fruit-bushes, raspberries producing the greatest amount of honey.

The three hives have been stored for winter in an upper room of a dwelling house, where the temperature can be regulated as desired.

HOPS.

All varieties produced a poor crop.
From Washington—Did not mature and hops were badly rusted.
do British Columbia—Did not mature and hops were badly rusted.
Native—Poor crop, hops fair in quality.

WEEDS.

Weeds are increasing with great rapidity, in many sections of the North-west Territories and in no previous year have they been so hard to keep in check.

The three worst varieties that have up to the present become prominent are Stink weed, Hares Ear Mustard and Tumbling Mustard. The first and second varieties mentioned seem to be the most difficult to eradicate; while Tumbling Mustard spreads more rapidly from the ease with which it travels over the country and its habit of distributing seed along its path.

On the Experimental Farm, in former years the Tumbling Mustard gave an endless amount of labour, as each fall, fresh seed was blown in from neighbouring fields. During the season of 1896, these hot-beds for this weed were taken in charge by the municipal council and little or no seed allowed to ripen. The same course was followed this year, with the result that we are now almost entirely free from this weed, except in the outer windbreaks where some still exists.

Hare's Ear Mustard does not spread to any great extent, and with very little attention and trouble when it first appears can be eradicated or held in check. If, however, it is neglected for a few years, the soil becomes so full of the seeds that an endless amount of labour is entailed in bringing it to a clean state.

Stink weed is without doubt the worst weed in the Territories to-day, from the fact of its being able to stand the most severe winter and cultivation and ripen its seeds several times during each season. Besides this the habit of having blossoms and ripe seed at the same time makes it a most dangerous weed. It spreads invisibly, unlike Tumbling Mustard, it does not blow from the place it grew. Pulling by hand and burning is the only effectual way of killing this weed.

The bulletin on "weeds," issued by Dr. Fletcher, under your direction, is much appreciated by farmers in the Territories, and a copy should be in the hands of every one interested in agriculture.

ENSILAGE.

The corn ensilage of 1896 gave by far the greatest satisfaction of any fed since the first of this valuable fodder was made on the farm. The corn in that year was in the glazed state when cut, and afforded good material for the preparation of ensilage. Feeding was started early in November last, and when the herd was turned out to pasture in June this year, a good deal of ensilage was still on hand. This year neither the supply nor quality equals that of 1896. No covering was put over the ensilage this year, and very little has spoiled, not over one inch on the top of the silo being unfit for use. In former years a covering of cut straw was put over the cut corn in the silo.

DISTRIBUTION OF SAMPLES OF GRAIN, POTATOES, FOREST-TREES, ETC.

During the months of March, April and May, the following distribution of products of the farm was made to applicants throughout Assiniboia, Alberta and Saskatchewan.

The number of applications for samples was largely in excess of our supply.

Samples Distributed.	Number.	Total.
Wheat, 3-lb. bags	253	
Oats "	401	
Barley "	259	
Pease "	233	
Rye "	18	
Flax "	2	
		1,166
Forest Trees—		
Artemisia Abrotanum, cuttings	6,200	
Caragana Arborescens, seedlings	1,920	
Willow, cuttings	2,120	
Poplar "	1,836	
Maple (Box Elder), seedlings	4,500	
Lilac "	70	
Ash "	150	
		16,796
Fruit Bushes—		
Raspberries, roots	2,680	
Currants, roots and cuttings	5,420	
Gooseberries, roots	210	
Plum seedlings	350	
		8,660
Garden seeds, packages	139	
Potatoes, 3-lb. bags	372	
Bromus Inermis Grass, 1-lb. bags	590	
Rhubarb, roots	348	
Ash, seed	570	
Maple, seed	570	
Caragana Arborescens, seed	320	
Strawberries	192	

SUMMARY.

Samples.	Bags and Packages.	Roots, Cuttings and Seedlings.
Grain	1,166	.....
Forest trees	.....	16,796
Fruit bushes	.....	8,660
Garden seeds	139	.....
Tree seeds	1,460	.....
Bromus Inermis grass seed	590	.....
Potatoes	372	.....
Rhubarb	.....	348
Strawberries	.....	192
	3,727	25,996

IMPROVEMENTS.

The improvements consist, chiefly, of planting avenues of trees on the cross roads of the farm and in repairing dams or water reservoirs where washed out by the great rains of June last. Not only was the damage considerable, in so far as the amount of labour required to repair them was concerned, but from the loss of water, as from this source all the water supply for stock is obtained.

CORRESPONDENCE.

During the twelve months ending 31st October, 1897, 3,183 letters were received and 3,395 mailed from this office. In letters received, reports on grain and other samples, are not counted, and in letters mailed, circulars of instruction *re* grain and other samples are not included.

MEETINGS ATTENDED.

Agricultural and dairy meetings and exhibitions were attended during the year, at the following towns:—Fort Qu'Appelle, Moosejaw, Regina, Qu'Appelle Station, Wolseley, Grenfell, Moosomin and Indian Head.

VISITORS.

Visitors to the farm, chiefly from surrounding districts, were numerous during the months of June, July and August. Among those from a distance were Lord and Lady Kelvin and other distinguished members of the British Association.

METEOROLOGICAL.

Month.	Highest Temperature.		Lowest Temperature.		Snow-fall, inches.	Total Rainfall.		Total Hours of Sunshine.
	On	Degrees	On	Degrees		No. of Days.	Inches.	
1896.								
November	4	34	19	—38	14	0	0	70·
December	9	45	1	—33	4	0	0	65·5
1897.								
January	8	34	24	—38	3	0	0	95·1
February	5	30	26	—34	5	0	0	96·4
March	30	38	14	—48	3	0	0	140·9
April	17	78	28	15	0	0	0	130·6
May	4	91	13	20	0	0	0	290·9
June	13	92	28	5	0	5	11·2	213·6
July	27	91	30	39	0	6	1·52	261·1
August	11	91	30	34	0	2	1·3	235·3
September	6, 21, 22	87	16	22	0	2	·2	154·5
October	1	79	9	8	0	1	·4	113·6
					29	16	14·62	1,867·5

I have the honour to remain, sir,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., 30th November, 1897.

To DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my ninth annual report of the work done on the Experimental Farm at Agassiz.

A cold wave struck the province in November, 1896, doing some damage to fruit trees which were yet growing, and catching some unharvested root crops, but the weather during the winter was mild. The lowest temperature recorded at this station being nine degrees above zero, on the 27th of November.

The spring opened fairly early, and the weather during seeding was favourable, followed by fine growing weather, with sufficient rainfall, and crops of all kinds throughout the province have been good.

Nearly nine acres of land have been cleared, and part of it cropped since my last report.

HEDGES.

The hedges have made a fine growth this year. Two of willows and one of beech were added last spring.

FOREST TREE PLANTATION.

The forest tree belt continues to make vigorous growth, and several of the Spanish chestnut trees planted in the belt bore fruit this year, producing nuts of large size.

ORNAMENTAL TREES AND SHRUBS.

The ornamental trees and shrubs on the lawn, and the bulb and flower beds have produced a profusion of bloom, from the last of March up to about the 15th of this month.

DISTRIBUTION OF SEED GRAINS AND POTATOES.

A considerable number of 3-pound bags of seed grain and potatoes have been distributed, and reports returned show that owing to the varying climatic conditions existing in British Columbia, grains or potatoes which do well in one locality, may not do so well in another.

A number of sample packages of small fruit plants were distributed, and so far as heard from, these have done well. Packages of tree seeds were also sent out, quite a number of maple and other forest trees having borne seed this year.

BEES.

The two swarms of bees wintered last winter, each threw off a swarm this season, both of which were hived, but one swarm abandoned its hive the next day.

AUSTRALIAN SALT BUSH.

The Australian salt bush mentioned in my last report, was entirely killed by the frost in November.

ACKNOWLEDGMENTS.

The following gentlemen, or firms, have kindly sent trees or scions of new fruits for testing :

Prof. Shinn, of Berkeley, California—Scions of apple and pear.
Prof. J. A. Balmer, of Pullman, Washington—Scions of apple and pear.
Mr. Alfred Woodroffe, of Auckland, N.Z.—Scions of apples.
Messrs. W. W. Walker, Salem, Oregon—Cherry and apple trees.
Oregon Wholesale Nursery Co., Salem, Oregon—Apple and cherry trees.
Mr. Hoskins, of Springbrook, Oregon—Scions of cherry.
Mr. H. Kipp, Chilliwhack, B.C.—Scions of seedling pear.
Mr. J. C. Mollet, Salt Spring Island—Scions of cherry.
Pears, 31 ; apples, 122=153.

A number of these are seedlings of merit not yet introduced, and a fair measure of success has attended the budding and grafting of all of them.

FALL WHEAT.

Twenty-eight varieties of fall wheat were sown early last October, and an even promising growth was made up to the November frost, which killed out most varieties entirely, and in none were more than a few plants left.

The ground was harrowed in the spring, and a mixed crop for green feed was sown.

EXPERIMENTS WITH SPRING WHEAT.

Thirty-eight varieties of spring wheat were tested this year. The land was loamy and fairly even throughout, and in a very fair condition as to fertility. The size of the plots was one-twentieth acre each, and all were sown on the 14th and 17th of April. There was very little smut, and no rust to injure the crop, and the quality of the grain is very good.

SPRING WHEAT—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	
			Inches.		In.		Lbs.	Bush.	Lbs.
White Connell	Aug. 18..	126	48	Stiff & bright	3½	Bald	3,800	31	40
Wellman's Fife...........	" 17..	125	42 to 48	" ..	4	"	4.400	31	20
Preston.	" 13..	121	50 to 54	" ..	3	Bearded..	4,160	31	..
Captor..........	" 9..	117	52 to 56	" ..	3½	Bald	4,300	30	40
Monarch.................	" 17..	125	46 to 50	" ..	4	"	4,000	30	40
Alpha	" 13..	121	40 to 42	" ..	3	"	3,600	30	..
White Russian.....	" 13..	123	48 to 52	" ..	4	"	4,200	30	..
Red Fife....	" 13..	121	44 to 48	" ..	3½	"	4,600	29	40
White Fife....	" 18..	126	48 to 50	" ..	3½	"	4,000	29	20
Old Red River	" 18..	126	48 to 50	" ..	4½	"	3,540	29	20
Rideau.	" 9..	117	34 to 38	" ..	3	"	3,900	29	..
Herisson Bearded	" 17..	125	40 to 42	" ..	2½	Bearded..	4,200	[illegible]	40
Admiral	" 13..	121	52 to 56	" ..	3½	Bald	3,800	28	20
Vernon.....	" 18..	126	44 to 46	" ..	3	Bearded..	3,900	28	20
Goose	" 18..	126	48 to 50	" ..	4	" ..	3,900	28	20
Progress..................	" 18..	126	44 to 48	" ..	4	Bald	4,100	28	..
Hungarian	" 18..	123	48 to 50	" ..	4	Bearded..	4,000	28	..
Pringle's Champlain	" 18..	126	46 to 50	" .	4	" ..	3,500	27	40
Advance	" 17..	125	48 to 50	" ..	3½	" ..	3,300	27	20
Huron	" 18..	126	46 to 48	" ..	3½	" ..	3,900	27	20
Countess..	" 13..	121	42 to 46	" ..	3½	Bald	4,000	27	20
Blenheim......	" 18..	126	46 to 50	" ..	3½–4	Bearded..	3,800	27	20
Beaudry	" 13..	121	52 to 56	" ..	3	" ..	4,200	27	..
Golden Drop...	" 9..	117	46 to 50	" ..	3	Bald	4,200	27	..
Percy.....................	" 7..	115	48 to 52	" ..	4	"	3,800	27	..
Black Sea	" 7..	112	42 to 44	" ..	3½	Bearded..	4,000	27	..
Campbell's White Chaff....	" 13..	121	40 to 44	" ..	3	Bald	3,300	26	40
Dion's	" 18..	126	46 to 48	" ..	4½	Bearded..	3,800	26	40
Crown	" 18..	126	46 to 50	" ..	4½	" ..	3,800	26	..
Rio Grande...............	" 17..	125	45 to 48	" ..	4	" ..	4,000	26	.
Red Fern..	" 17..	125	46 to 48	" ..	4	" ..	5,700	25	40
Stanley....................	" 13..	121	38 to 42	" ..	3	Bald	3,120	25	40
Ladoga....................	" 6..	114	36 to 40	" ..	3½	Bearded..	3,120	25	20
Dawn	" 5..	113	32 to 34	" ..	4	Bald	3,400	25	00
Beauty......	" 7..	115	42 to 45	" ..	4	"	3,600	24	20
Emporium	" 18..	126	56 to 60	" ..	5	Bearded..	3,100	24	20
Dufferin	" 13..	121	42 to 44	" ..	3	" ..	3,300	23	20
Colorado	" 18..	123	50 to 52	" ..	4	" ..	3,700	23	20

EXPERIMENTS WITH OATS.

Sixty-four varieties were sown on loamy soil on the 16th of April on plots of one-twentieth of an acre each.

These plots were sown in the apple orchard, on land that had been partly in corn and part of it in oats in 1896. The following varieties were injured by rust, especially: the White Russian, Mortgage Lifter, Olive, White Wonder, Victoria Prize, and Abundance; and some plots have suffered owing to the land on which they were sown having been dug to a depth of three or four feet in taking out fir stumps. In such cases it requires a number of years of cultivation to restore the land to a condition equal to that adjoining, which has not been grubbed to such a depth.

The growth of straw was very rank, but the weight of straw shown in the following table is greater than it would be but for the ferns, of which there were a good many in all the plots.

OATS—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	
			In.		In.		Lbs.	Bush.	Lbs.
Early Maine	Aug. 12	117	66	Stiff & bright	10	Branching	6,200	92	32
Black Beauty	″ 12	117	60	″	12	″	6,900	92	32
Golden Giant	″ 11	116	68	″	12	Sided.	6,600	89	14
Lincoln	″ 5	110	52	″	8½	Branching	6,640	87	22
Oderbruch	″ 19	124	66	″	11	Half ″	6,400	82	32
Early Blossom	″ 16	121	66	″	12	″ ″	6,300	77	22
Improved American	″ 16	121	65	″	11	Branching	5,600	77	22
Buckbee's Illinois	″ 15	120	66	″	10	″	6,300	76	16
Bavarian	″ 16	121	60	″	10½	″	6,400	75	30
American Beauty	″ 14	119	60	″	10	″	6,200	74	24
Flying Scotchman	″ 12	117	66	″	12	″	5,500	74	4
Columbus	″ 4	109	58	″	9	″	6,200	73	18
Scottish Chief	″ 17	122	63	″	10½	″	6,040	73	18
Wide Awake	″ 17	122	60	″	10½	″	6,600	73	18
Coulommier's	″ 18	123	60	″	11	″	6,100	72	32
Bonanza	″ 12	117	66	″	10	″	5,600	71	26
Cromwell	″ 12	117	60	″	12	″	6,000	71	26
King	″ 17	122	60	Fair	10½	″	4,700	71	26
Cream Egyptian	″ 17	122	68	Weak	11	″	6,400	70	20
Rosedale	″ 17	122	66	″	10	Half sided	5,440	70	20
Doncaster Prize	″ 3	108	62	Stiff	9½	Branching	6,500	70	10
Prolific Black Tartarian	″ 16	121	66	Fair	12	Sided	7,000	70	
White Russian	″ 4	109	57	Stiff	9	Branching	5,700	70	
American Triumph	″ 14	119	52	Fair	10	″	5,800	69	24
Golden Tartarian	″ 12	117	66	″	11	Sided.	5,400	69	14
Wallis	″ 16	121	60	″	11	Branching	6,600	69	4
White Schonen	″ 4	109	56	Stiff	8½	″	5,680	68	28
Hazlett's Seizure	″ 12	117	54	Medium	10	″	5,900	68	28
Miller	″ 12	117	60	Weak	10	″	5,400	68	18
Brandon	″ 12	117	72	″	12	″	6,500	68	8
Siberian	″ 19	124	65	Fair	11½	Sided.	7,500	67	22
White Monarch	″ 16	121	70	Weak	14	Branching	7,200	67	2
Golden Beauty	″ 14	119	60	Medium	10½	″	6,200	66	26
Early Etampes	″ 14	119	66	″	12	″	6,200	66	16
Early Archangel	″ 12	117	66	Weak	10	″	6,900	66	16
Welcome	″ 14	119	54	″	8½	″	5,000	66	12
Mortgage Lifter	″ 5	110	57	Fair	8½	″	5,400	66	8
New Electric	″ 11	115	60	″	10	″	5,200	65	30
Olive (Black)	″ 16	121	66	Weak	12	Half sided	6,800	65	10
Early Golden Prolific	″ 14	119	60	″	10	Branching	5,500	65	10
Scotch Hopetoun	″ 16	121	60	″	10	″	6,400	64	24
Rennie's Prize White	″ 13	118	66	Fair	11	″	6,000	64	24
Imported Irish	″ 11	116	66	″	10	″	6,200	64	4
Banner	″ 12	117	68	Strong	12	″	5,760	64	4
Improved Ligowo	″ 12	117	64	Medium	10	″	5,600	63	18
Newmarket	″ 17	122	62	Fair	9	″	5,200	62	32
Holstein Prolific	″ 16	121	60	″	11	″	5,800	62	22
White Poland	″ 3	108	60	″	10	″	5,200	62	17
Early Gothland	″ 14	119	66	Weak	10	Half sided	5,600	62	12
Medal	″ 12	117	72	″	12	Branching	6,200	62	2
Joanette	″ 14	119	56	Fair	10	″	5,100	61	16
California Prolific Black	″ 12	117	60	″	10	Sided.	4,700	61	8
Oxford	″ 14	119	66	Medium	12	Branching	5,080	60	20
Siberian O.A.C.	″ 17	122	60	″	10	Sided	5,000	60	10
Winter Grey	″ 3	107	62	″	9	Branching	5,800	60	
Russell	″ 16	121	63	″	12	Half sided	4,900	59	14
Abyssinia	″ 14	118	60	Weak	10½	″	5,700	58	28
Prize Cluster	″ 11	115	56	Fair	9½	Branching	5,000	58	28
White Wonder	″ 16	121	66	Weak	12	″	5,600	58	18
Mennonite	″ 3	107	53	Medium	9	″	4,400	57	32
Victoria Prize White	″ 3	107	63	″	9½	″	5,920	52	32
Abundance	″ 16	121	56	″	10	″	5,210	52	22
Master	″ 11	115	67	Weak	11	″	4,600	52	12
Pense	″ 16	121	54	Strong	10	Sided.	5,100	42	32

EXPERIMENTS WITH BARLEY.

Thirty-five varieties of barley have been grown in uniform test plots of one-twentieth acre each, fifteen of these were two-rowed sorts and twenty were six-rowed. They were all sown on loamy soil of fairly uniform character on the 17th of April. No injury was done by rust or smut.

BARLEY, TWO-ROWED—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
			Inches.		In.	Lbs.	Bush.	Lbs.
Kinver Chevalier	Aug. 14	119	36 to 38	Stiff	3¼	3,600	40	40
Canadian Thorpe	" 14	119	41 to 43	"	3½	3,200	37	4
French Chevalier	" 14	119	37 to 39	"	3	3,400	37	4
Nepean	" 14	119	43 to 45	Weak	3½	3,280	32	44
Prize Prolific	" 13	118	40 to 42	Fair	4	3,400	32	24
Newton	" 15	120	41 to 43	"	3½	2,900	31	12
Danish Chevalier	" 12	117	36 to 38	"	3	3,600	31	12
Thanet	" 14	119	34 to 36	"	3	3,200	31	12
Victor	" 16	121	44 to 46	"	3½	2,500	30	20
Pacer	" 9	114	34 to 36	"	3½	3,000	29	8
Beaver	" 13	118	43 to 45	Weak	3½	3,380	28	36
Monck	" 12	117	48 to 50	"	3½	2,900	28	16
Bolton	" 14	119	40 to 42	Fair	3	2,600	28	6
Sidney	" 11	116	33 to 35	Stiff	3	2,700	27	24
Rigid	" 10	115	43 to 45	"	3½	3,520	27	4

BARLEY, SIX-ROWED—Test of Varieties.

Blue	Aug. 7	112	38 to 40	Stiff & clean.	3½	3,900	42	24
Oderbruch	July 28	102	26 to 30	"	2½	3,600	40	20
Petschora	" 28	102	24 to 26	"	2	3,200	38	36
Mensury	Aug. 5	110	40 to 42	"	2½	3,700	88	16
Common 6-rowed	" 6	111	32 to 34	Fair	3	3,600	38	16
Vanguard	" 2	107	28 to 32	"	2½	3,740	37	24
Rennie's Improved	July 28	102	30 to 32	"	2½	3,900	37	24
Royal	Aug. 2	107	28 to 30	"	3	2,800	36	22
Pioneer	" 2	107	34 to 36	"	3	3,500	36	12
Nugent	" 7	112	40 to 42	"	2¾	2,840	35	20
Stella	" 7	112	33 to 35	"	3¼	3,700	34	8
Odessa	" 7	112	38 to 40	"	3¼	2,800	33	36
Champion	July 28	102	24 to 26	"	2½	3,100	33	16
Phœnix	" 28	102	25 to 28	"	2¼	3,300	33	16
Surprise	Aug. 7	112	38 to 40	Weak	3½	2,760	33	44
Summit	" 7	112	40 to 42	"	4	2,940	33	24
Trooper	" 6	111	40 to 41	"	3¼	2,740	32	30
Baxter's	" 3	108	34 to 36	Fair	3	2,500	32	30
Success	July 28	102	23 to 25	"	2½	3,000	32	10
Excelsior	Aug. 5	110	32 to 34	"	2½	2,400	30	00

EXPERIMENTS WITH PEASE.

These plots were sown on sandy loam, this land had been cleared and cropped for a number of years before the Experimental Farm was established and had got very weedy with sorrel, and in this soil and climate that is a very difficult weed to get rid of. The pease also suffered from mildew to a considerable extent. The size of the plots was one-twentieth of an acre each, and all were sown on the 1st of May.

Pease—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.		Length of Pod.	Size of Pea.	Yield per Acre.	
				Inches.	Tons.	Lbs.	Inches.		Bush.	Lbs.
King	Aug. 16..	107	Medium....	50 to 55	1	1,600	2½ to 3	Large....	31	20
Bright	" 25..	116	"	50 to 60	1	1,500	2½ to 3	Medium..	30	20
Archer	" 14..	105	Rank	30 to 36	2	1,300	2 to 3	" ..	29	40
Nelson	" 25..	116	"	30 to 36	2	1,600	2 to 2½	" ..	29	20
Vincent	" 16..	107	Strong......	48 to 50	2	1,000	2 to 2½	Large....	28	40
Arthur	" 24..	115	Very strong.	55 to 60	2	1,800	2 to 2½	Medium..	28	20
Canadian Beauty	" 23..	114	Rank......	36 to 40	3	300	2¾ to 3	Large....	27	20
Prince Albert	" 23..	114	Strong......	36 to 40	2	1,400	2½ to 3	Small....	26	..
Creeper	" 13..	105	"	30 to 34	2	980	2 to 2¼	"	25	20
Bedford	" 24..	115	Medium....	34 to 40	2	700	2½ to 3	Large....	25	20
Prussian Blue	" 23..	114	"	36 to 40	2	600	3 to 3½	Medium..	24	40
Kent	" 23..	114	"	30 to 34	2	900	3 to 3½	Large....	24	40
White Marrowfat	" 25..	116	Strong......	32 to 36	2	1,800	2¼ to 2¾	" ...	24	40
Early Briton	" 14..	106	Medium....	36 to 40	1	1,000	2 to 2½	"	24	20
Macoun	" 23..	114	Strong......	30 to 34	2	1,400	2½ to 3	"	24	..
Victoria	" 10..	103	Medium....	24 to 28	2	400	1⅓ to 2	Small....	24	..
Duke	" 24..	115	Strong......	34 to 38	2	1,600	2¼ to 2¾	Large....	23	40
White Wonder	" 14..	106	Medium....	22 to 26	1	900	2 to 2¼	Medium..	23	40
Elephant Blue	" 25..	116	Strong......	34 to 36	2	900	2¼ to 2¾	....	23	20
Chancellor	" 25..	116	"	34 to 38	2	900	3 to 3¼	Small....	23	20
Carleton	" 24..	115	"	30 to 36	2	300	2½ to 2¾	Medium..	23	..
Perth	" 16..	108	Medium....	65 to 72	1	1,500	2½ to 3	Large....	23	..
Oddfellow	" 25..	116	Strong......	32 to 36	2	800	2¼ to 2¾	....	23	..
Bruce	" 23..	114	"	30 to 36	2	500	2½ to 3	Large....	22	40
Paragon	" 16..	108	"	30 to 34	2	700	2 to 2½	Medium..	22	40
Mummy	" 14..	106	"	38 to 42	2	600	3 to 3½	" ..	22	..
Harrison's Glory	" 14..	106	"	24 to 28	2	...	3 to 3½	....	21	40
Alma	" 25..	116	"	34 to 38	2	900	2½ to 3	Small....	20	20
Golden Vine	" 14..	106	"	46 to 50	2	700	2¼ to 2¾	"	20	20
Prince	" 23..	114	"	36 to 40	2	300	2½ to 3	Large....	20	..
Trilby	" 25..	116	"	28 to 32	2	100	2 to 2½	Medium..	20	..
New Potter	" 14..	106	"	36 to 40	2	400	2½ to 3	Large....	19	40
Centennial	" 23..	114	Medium....	32 to 36	1	1,800	2 to 2½	Medium..	17	40
Mackay	" 23..	114	Strong......	28 to 32	2	1,900	2½ to 3	Large....	17	40
Black Eye Marrowfat	" 23..	114	"	28 to 30	2	1,300	2 to 2½	"	16	40
Multiplier	" 23..	114	"	34 to 38	2	500	2½ to 3	Small....	16	20
Daniel O'Rourke	" 12..	104	"	18 to 22	2	500	1⅓ to 2	"	16	20
Pride	" 13..	105	"	28 to 32	1	1,700	2 to 2½	Large....	16	20
Agnes	" 14..	106	Medium....	50 to 56	1	1,600	3 to 3½	"	14	40
Crown	" 16..	108	"	30 to 34	1	1,700	1½ to 2	Small....	13	20

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

These plots were sown on loamy soil that had been under grain the previous year, part of it in oats and the remainder wheat. It was all ploughed early in spring and thoroughly harrowed when the first plots of the series were sown, and the unsown portion harrowed when each subsequent sowing was made. There was no smut, but rust on the oats and mildew on the pea vines lessened the yield of those grains. There was no rust on the wheat or barley plots. The size of the plots was one-twentieth acre each.

Oats—Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	
				Inches.		Inches.		Lbs.	Bush.	Lbs.
Banner.........	April 8	Aug. 12	126	54 to 55	Strong growth	10	Branching	4,000	55	10
″	″ 15	″ 14	121	58 ″ 60	″ ″	10	″ ..	4,120	62	12
″	″ 22	″ 14	114	58 ″ 60	″ ″	10	″ ..	4,400	64	24
″	″ 29	″ 16	109	60 ″ 62	″ ″	10½	″ ..	6,100	72	32
″	May 6	″ 18	104	60 ″ 62	″ ″	10½	″ ..	5,960	76	16
″	″ 13	″ 23	102	60 ″ 64	″ ″	10	″ ..	6,300	73	18
Abundance.....	April 8	″ 12	126	54 ″ 56	″ ″	9	″ ..	3,900	50	20
″	″ 15	″ 14	121	60 ″ 62	″ ″	10	″ ..	4,000	60	00
″	″ 22	″ 14	114	58 ″ 60	″ ″	10	″ ..	4,100	58	28
″	″ 29	″ 19	112	58 ″ 60	″ ″	10	″ ..	5,240	67	22
″	May 6	″ 22	108	60 ″ 62	″ ″	9	″ ..	5,400	55	30
″	″ 13	″ 23	102	60 ″ 62	″ ″	8½	″ ..	5,080	54	24

Spring Wheat—Early, Medium and Late Sowings.

Red Fife	April 8	Aug. 13	127	52 to 54	Stiff and bright	3½	Beardless.	4,800	30	40
″	″ 15	″ 16	123	52 ″ 54	″ ″	3½	″ .	5,200	36	20
″	″ 22	″ 17	117	56 ″ 58	″ ″	4	″ .	6,040	37	40
″	″ 29	″ 19	112	60 ″ 62	″ ″	4 to 4½	″ .	6,000	41	20
″	May 6	″ 21	107	50 ″ 52	″ ″	4	″ .	4,200	38	20
″	″ 13	″ 24	103	48 ″ 50	″ ″	4	″ .	5,000	35	00
Stanley	April 8	″ 9	122	54 ″ 56	″ ″	4½	″ .	4,500	32	45
″	″ 15	″ 15	121	52 ″ 54	″ ″	3½	″ .	5,200	41	45
″	″ 22	″ 17	116	52 ″ 54	″ ″	4	″ .	6,100	41	50
″	″ 29	″ 19	111	56 ″ 60	″ ″	4½	″ .	7,300	42	20
″	May 6	″ 21	106	56 ″ 58	″ ″	4	″ .	6,000	29	40
″	″ 13	″ 24	102	50 ″ 52	″ ″	3½	″ .	4,000	30	20

Barley—Early, Medium and Late Sowings.

Canadian Thorpe	April 8	Aug. 9	123	43 to 45	Stiff and bright	3	2-rowed...	4,480	41	12
″ ..	″ 15	″ 13	114	44 ″ 48	″ ″	3½	″ ..	4,100	43	36
″ .	″ 22	″ 14	108	44 ″ 46	″ ″	3½	″ ..	4,200	40	30
″ ..	″ 29	″ 16	103	46 ″ 48	″ ″	4	″ ..	4,210	40	40
″ ..	May 6	″ 18	98	44 ″ 46	″ ″	4	″ ..	4,220	42	24
″ ..	″ 13	″ 21	94	44 ″ 46	″ ″	4	″ ..	4,800	45	25
Odessa	April 8	″ 4	118	32 ″ 34	″ ″	3	6-rowed...	3,000	28	36
″	″ 15	″ 6	113	40 ″ 42	″ ″	3½	″ ..	3,400	32	9
″	″ 22	″ 9	109	37 ″ 39	″ ″	3	″ ..	4,100	37	15
″	″ 29	″ 13	106	41 ″ 43	″ ″	3	″ ..	3,760	35	20
″	May 6	″ 14	100	36 ″ 38	″ ″	3	″ ..	3,900	33	16
″	″ 13	″ 17	96	38 ″ 40	″ ″	3	″ ..	4,100	42	24

PEASE—Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Character of Straw.	Length of Straw.	Weight of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.
					Inches.	Lbs.	Inches.		Bush. Lbs.
Mummy.......	April 8	Aug. 9	123	Medium......	36 to 38	4,100	2½	Medium..	25 00
"	" 15	" 12	119	"	36 " 38	4,040	2	" ..	24 40
"	" 22	" 14	114	"	33 " 36	3,600	2	" ..	20 30
"	" 29	" 16	109	"	33 " 36	3,840	2¼	" ..	22 40
"	May 6	" 17	103	"	33 " 36	3,940	2¼	" ..	25 20
"	" 13	" 19	98	"	30 " 34	3,700	1¾	" ..	20 00
Golden Vine....	April 8	" 10	124	Strong........	45 " 50	2,960	2	Small	20 00
"	" 15	" 12	119	"	44 " 48	3,200	2	"	20 40
"	" 22	" 14	114	"	44 " 48	3,300	1¾	"	19 20
"	" 29	" 16	109	" ...	42 " 46	3,160	1¾	"	21 00
"	May 6	" 17	103	"	44 " 48	3,400	1½	"	17 20
"	" 13	" 19	98	"	46 " 50	4,000	1½	"	18 40

EXPERIMENTS WITH INDIAN CORN.

Twenty-six varieties of corn were tested in hills three feet apart each way and in drills three feet apart. The drills were thinned to leave one plant per foot of drill and hills to leave three plants in each hill. The soil was a warm sandy loam that had been in roots in 1896.

The season was favourable for corn and the yields as shown in the following table have been very good. The yield in each case has been calculated from 2 rows each 66 feet long.

INDIAN CORN—Test of Varieties.

Name of Variety.	Date of Sowing.	Character of growth.	Height.	When Tasselled.	In Silk.	Early Milk.	Late Milk.	Condition when cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
			Inches.						Tons.	Lbs.	Tons.	Lbs.
Red Cob Ensilage	May 18	Very strong	144 to 160	Aug. 10	Aug. 28	Sept. 18	....	Roasting ear	43	900	40	1,950
Selected Leaming	" 18	"	112 to 120	" 5	" 18	" 12	Sept. 22	Beginning to glaze.	43	900	35	1,050
Cuban Giant	" 18	"	120 to 130	" 22	Sept. 14	....	....	Cobs formed	42	700	31	750
Early Butler	" 18	"	114 to 120	" 2	Aug 16	Aug. 27	Sept. 16	Glazed	37	800	31	700
Mammoth 8 rowed Flint	" 18	"	108 to 114	" 7	" 18	Sept. 1	" 21	Late milk	35	950	31	1,300
North Dakota White	" 18	"	78 to 84	" 6	" 16	" 2	" 17	Glazed	34	200	33	1,100
Angel of Midnight	" 18	Medium	84 to 90	" 13	" 27	" 11	....	Late milk	33	....	31	700
Giant Prolific Ensilage	" 19	Slender	108 to 120	" 18	" 30	" 20	....	Early milk	32	350	32	1,450
Thoroughbred White Flint	" 18	Strong	84 to 96	" 8	" 22	" 10	Sept. 21	Commencing to glaze.	29	300	31	1,800
King of the Earliest	" 18	Slender	114 to 120	" 7	" 20	" 7	" 20	Glazing	31	700	28	1,200
Ninety Day	" 18	Strong	88 to 100	" 6	" 11	" 2	" 15	Glazed	29	1,400	26	800
Pearce's Prolific	" 18	"	84 to 96	" 10	" 20	" 6	" 18	"	28	100	19	500
Champion White Pearl	" 18	"	90 to 96	" 22	Sept. 10	....	....	Cobs long but not in milk.	27	780	26	250
Clouds Early Yellow	" 18	Slender	80 to 90	" 16	Aug. 28	Sept. 18	....	Roasting ear	24	400	27	450
Wisconsin White Dent	" 19	Medium	78 to 84	" 20	" 29	" 26	....	Early milk	26	1,350	26	250
Sanford	June 1	"	72 to 78	" 13	" 26	" 11	Sept. 20	Glazed	22	....	26	470
Mammoth Sweet Fodder	May 19	"	80 to 90	" 17	" 26	" 20	....	Roasting ear	26	800	19	500
Canadian White Flint	June 1	"	72 to 78	" 11	" 25	" 10	Sept. 22	Glazing	17	1,860	26	690
Kendall's Giant	May 19	Slender	84 to 90	" 18	" 30	" 20	....	Early milk	24	950	20	1,250
Wisconsin Yellow Dent	June 1	"	78 to 84	" 20	" 30	" 18	Sept. 28	Late milk	21	1,450	20	1,800
Longfellow	May 18	Strong	72 to 78	" 4	" 13	Aug. 30	" 14	Glazed	19	610	20	1,360
White Cap Yellow Dent	" 18	Medium	72 to 78	" 17	" 28	Sept. 16	....	Roasting ear	20	800	18	1,950
Comptons Early	" 18	"	72 to 80	" 6	" 23	" 9	Sept. 21	Late milk	18	1,840	13	150
North Dakota Yellow	" 29	Slender	72 to 78	" 4	" 14	" 6	" 20	Glazed	16	780	17	1,200
Pride of the North	" 18	"	84 to 90	" 20	" 28	" 20	....	Roasting ear	14	1,810	16	1,220
Mitchell's Extra Early	" 18	Medium	54 to 60	July 18	July 29	Aug. 20	Aug. 28	Ripe	10	1,560	14	50

EXPERIMENTS WITH TURNIPS.

These roots, like the carrots, were sown on comparatively new land, which had been in oats the previous year. The growth was strong and even. Soil, a warm loam, ploughed early in spring and harrowed several times before sowing. Eighteen varieties were tested, and two sowings were made, the first on the 14th of May and the second on the 28th of May, and the roots from both were pulled on the 18th of October. The yield has been calculated from three rows each 66 feet long and 2½ feet apart.

TURNIPS—Test of Varieties.

Name of Variety.	Yield per acre.—1st Plot.		Yield per acre.—1st Plot.		Yield per acre.—2nd Plot.		Yield per acre.—2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Prize Winner	66	1,555	2,059	14	49	1,000	1,650	..
Prize Purple Top	58	1,040	1,950	40	58	160	1,936	..
Selected Purple Top	57	48	1,900	48	47	600	1,576	40
East Lothian	56	1,168	1,888	8	60	384	2,006	24
Halewood's Bronze Top	56	200	1,870	..	51	80	1,701	20
Hartley's Bronze	55	880	1,848	..	50	1,376	1,689	36
Skirvings	55	....	1,833	30	49	1,264	1,654	24
Jumbo or Monarch	54	1,120	1,818	40	51	1,400	1,723	20
Giant King	53	1,712	1,795	12	47	840	1,580	40
Marquis of Lorne	53	1,360	1,789	20	52	1,600	1,760	..
Carter's Elephant	53	40	1,767	20	48	1,504	1,625	4
Hall's Westbury	51	960	1,716	..	48	800	1,613	20
Mammoth Clyde	50	760	1,679	20	44	880	1,481	20
Perfection Swede	49	208	1,636	48	50	1,376	1,689	36
Bangholm Selected	47	600	1,576	40	46	840	1,547	20
Champion Purple Top	47	600	1,576	40	45	200	1,503	20
Sutton's Champion	45	200	1,503	20	42	1,360	1,422	40
Shamrock Purple Top	40	520	1,342	..	40	960	1,309	20

EXPERIMENTS WITH MANGELS.

Eighteen varieties of mangels were tested along side the turnips, in similar loamy soil, the conditions in every respect being practically the same. These also show the advantage of early sowing.

All the roots this season are smooth, even, and remarkably free from prongs, or long neck. The yields are made up from the produce of three rows, each 66 feet long, and two feet and a half apart.

Two sowings were made, the first on the 24th of April, the second on the 8th of May, and the roots from both were pulled on the 15th of October.

MANGELS.—Test of Varieties.

Name of Variety.	Yield per acre. — 1st Plot.		Yield per acre. — 1st Plot.		Yield per acre. — 2nd Plot.		Yield per acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Selected Mammoth Long Red	39	1,024	1,317	4	32	240	1,070	40
Red Fleshed Tankard	39	320	1,305	20	35	400	1,173	20
Golden Fleshed Tankard	39	140	1,302	24	35	400	1,173	20
Norbiton Giant	35	1,456	1,190	56	34	1,960	1,166	..
Canadian Giant	35	752	1,179	12	28	1,200	953	20
Giant Yellow Intermediate (Steele)	34	1,080	1,151	20	31	40	1,034	..
Gate Post	34	992	1,149	52	36	160	1,202	40
Mammoth Long Red	32	1,824	1,097	4	30	1,600	1,026	40
Giant Yellow half-long	31	1,360	1,056	..	28	672	944	32
Yellow Intermediate	31	1,184	1,053	4	27	1,000	916	40
Prize Mammoth Long Red	29	1,136	985	36	23	1,960	799	20
Ward's Large Oval Shaped	28	496	941	36	22	1,760	762	40
Giant Yellow Globe	27	1,264	921	4	25	600	843	20
Champion Yellow Globe	27	1,000	916	40	25	656	842	36
Giant Yellow Intermediate (Pearce	27	912	915	32	26	624	877	4
Golden Tankard	27	912	915	32	26	360	872	40
Red Fleshed Globe	24	1,280	801	20	24	400	806	40
Warden Orange Globe	19	1,424	657	4	18	80	601	20

EXPERIMENTS WITH CARROTS.

Fifteen varieties of carrots were tested, two sowings of each variety were made, two weeks apart, in drills one and one-half feet apart.

The soil was a sandy loam, and was new, having only been broken up in the spring of 1895, and was not yet thoroughly uniform, as shown by the heavier yields in the second sowing, in one or two cases. The character of the growth, however, was strong and fairly uniform.

The yields are calculated from three rows of 66 feet each. The first sowing was made on the 23rd of April, the second on the 7th of May, and the roots from both were pulled on the 15th of October.

CARROTS—Test of Varieties.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Giant White Vosges	37	1,680	1,261	20	46	400	1,540	
Yellow Intermediate	39	1,200	1,320	..	27	266	904	26
Improved Short White	33	1,466	1,124	26	30	1,893	1,031	33
Green Top White Orthe	33	880	1,114	40	26	800	880	
Carter's Orange Giant	31	1,360	1,056	..	23	640	777	20
Half Long White	31	333	1,038	53	22	1,760	762	40
Guerande or Ox-heart	30	1,600	1,026	40	29	1,840	997	20
White Belgian	30	1,600	1,026	40	24	160	769	20
Early Gem	27	560	909	20	20	480	674	40
Iverson's Champion	27	120	902	..	36	1,060	1,217	20
Half Long Chantenay	26	1,670	894	30	24	693	811	33
Mammoth White Intermediate	26	800	880	..	16	1,440	557	20
Scarlet Altringham	19	1,600	660	..	17	1,786	596	26
Long Orange or Surrey	18	960	616	..	21	240	704	
Scarlet Intermediate	11	880	381	20	13	1,280	454	40

EXPERIMENTS WITH SUGAR BEETS.

Six varieties of these roots were sown in sandy loam which had received a dressing of stable manure early in the spring of 1896, and had produced a crop of carrots that year.

The land was ploughed early in the spring and harrowed several times at short intervals to start and kill the weed seeds. Two sowings were made, the first on the 26th of April and the second on the 10th of May. The seed was sown in drills 2½ feet apart and the plants thinned to about 6 inches in the row. The growth was even and uniform and the roots from both sowings were pulled on the 15th of October.

The following table of weights per acre is calculated from the produce of three rows, each 66 feet long.

SUGAR BEETS—Test of Varieties.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Wanzleben	14	1,040	484	..	13	1,456	457	36
Danish Improved	14	952	482	32	13	1,104	451	44
Red Top Sugar	12	1,080	418	..	15	800	613	20
Danish Red Top	14	600	476	40	13	400	440	..
Improved Imperial	13	1,720	462	..	13	1,280	454	40
Vilmorin's Improved	13	400	440	..	12	1,520	425	20

EXPERIMENTS WITH POTATOES.

One hundred and eleven varieties of potatoes were planted in a strong clay loam, that had been in small fruits for several years.

Some varieties suffered slightly from rot, but the yield has been very fair in every case, and the quality of most varieties very good. They were planted from the 4th to the 28th of May, and dug from the 18th to the 25th of September.

POTATOES—Test of Varieties.

Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Clay Rose	633	36	633	36	None	....	612	..	21	36	Long pink.
American Wonder	598	24	598	24	"	....	538	54	59	30	" white.
Irish Daisy	591	36	562	..	29	36	506	..	56	..	" "
Brownell's Winner	563	12	563	12	None	....	506	30	56	42	Long flat red.
Abundance Late	550	..	550	..	"	....	527	30	22	30	Round white.
Late Puritan	536	48	510	..	26	48	458	..	52	..	Long white.
Seedling No. 7	535	20	535	20	None	....	481	40	53	40	Long red.
Early Sunrise	528	..	528	..	"	....	475	..	53	..	" pink.
Early Puritan	528	..	528	..	"	....	473	..	55	..	" white.
Clarke's No. 1	528	..	528	..	"	....	448	48	79	12	" pink.
Prize Taker	528	..	528	..	"	....	396	..	132	..	" red.
Rose No. 9	513	20	513	20	"	....	460	20	53	..	" "

POTATOES—Test of Varieties—*Continued.*

Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Vanier	506	..	506	..	None	....	455	..	51	..	Long dark red.
Empire State	498	40	498	40	"	....	423	52	74	28	" pink and white.
Reading Giant	481	4	481	4	"	....	433	..	48	4	" white.
Reeve's Rose	481	4	481	4	"	...	409	..	72	4	" rose.
Foreman's Early No. 4	469	20	469	20	"	....	421	30	47	50	Oval white.
Charles Downing	469	20	469	20	"	....	397	40	71	40	"
Monroe County	462	..	462	..	"	....	439	..	23	..	Long red.
Satisfaction	457	36	457	36	"	....	411	46	45	50	" white.
Troy Seedling	457	36	457	36	"	....	410	..	47	36	Round white.
World's Fair	454	40	454	40	"	....	386	40	68	..	" "
Brown's Rot Proof	454	40	454	40	"	....	409	..	45	40	Long dark red.
Henderson's Late Puritan	451	44	428	14	23	30	372	20	45	44	" white.
Pride of the Table	451	44	451	44	None	....	406	44	45	..	Long dark red.
Carman's No. 3	447	20	447	20	"	....	403	50	43	30	Oval white.
Maule's Thoroughbred	447	20	447	20	"	....	402	30	44	50	Long rose.
Dakota Red	445	52	445	52	"	....	401	22	44	30	" red.
State of Maine	440	..	440	..	"	....	394	30	45	30	Oval white.
Dreer's Standard	419	48	419	48	"	....	356	30	63	18	Round white.
Bill Nye	419	28	419	28	"	....	377	10	42	18	Long white.
Algoma No. 1	418	..	418	..	"	....	376	20	41	40	" rose.
Columbus	418	..	418	..	"	....	355	30	62	30	" pink.
Holborn Abundance	418	..	418	..	"	....	355	30	62	30	" white.
Pearce's Extra Early	414	..	401	30	12	30	359	30	42	..	" rose.
Vick's Extra Early	414	..	414	..	None	....	372	..	42	..	" pink.
New Queen	411	..	411	..	"	....	369	30	41	30	" "
New Variety No. 1	409	36	409	36	"	....	369	46	39	40	Round white.
Northern Spy	408	18	408	18	"	....	367	48	40	30	Long red.
Early Norther	408	18	408	18	"	....	367	48	40	30	" pink and white.
Great Divide	407	14	386	14	21	..	347	44	38	30	Long white.
Lee's Favourite	403	20	403	20	None	....	342	50	60	30	" rose.
Ohio Junior	403	20	403	20	"	....	322	40	80	40	" "
American Giant	374	..	355	..	19	..	307	..	46	..	Long white.
McKenzie	363	44	363	44	None	...	319	24	44	20	"
Peerless Junior	362	16	362	16	"	....	308	6	54	10	Oval white.
Lopas White	361	32	361	32	"	....	307	32	54	..	Long white.
Chicago Market	360	10	360	10	"	....	313	10	47	..	" red.
Quaker City	360	10	288	10	72	..	201	43	87	27	" white.
Everett	358	36	358	36	None	....	268	56	89	40	" pink.
Seedling 230	355	40	355	40	"	....	338	10	17	30	Round white.
Pride of the Market	354	12	354	12	"	....	336	30	17	42	Long white.
Seedling No. 3	354	..	354	..	"	....	283	10	70	50	" red.
Good News	352	30	352	30	"	....	317	30	35	..	" rose.
Crown Jewel	352	30	352	30	"	....	317	10	35	20	" "
Flemish Beauty Seedling	352	30	352	30	"	....	281	30	71	..	" pink.
Ashleaf Kidney	346	8	346	8	"	....	294	28	51	40	" white.
Early London	344	20	344	20	"	....	293	50	50	30	" pink.
Ideal	334	24	334	24	"	....	290	44	33	40	Oval "
Sharpe's Seedling	334	24	334	24	"	....	283	54	40	30	Long red.
Money Maker	330	..	314	..	16	..	283	30	31	30	" white.
Record	330	..	330	..	None	....	280	10	49	50	" "
Sir Walter Raleigh	330	..	330	..	"	....	281	30	48	30	Oval "
Rural Blush	322	40	322	40	"	....	290	20	32	20	Long white.
Rochester Rose	322	40	322	40	"	....	258	35	64	5	" rose.
Honeoye Rose	322	40	322	40	"	....	256	40	66	..	" "
Houlton Rose	322	40	322	40	"	....	242	..	80	40	" "
Earliest of All	319	44	319	44	"	....	272	14	47	30	" light rose.
Early White Prize	316	48	316	48	"	....	268	18	44	30	Long white.
Early Harvest	316	48	316	48	"	....	253	28	63	20	Long white.
Seattle	315	20	315	20	"	....	251	20	54	..	"
Victor Rose	308	..	308	..	"	....	278	..	30	..	Long rose.
Rural No. 2	308	..	308	..	"	....	261	30	46	30	Oval white.
Irish Cobbler	305	4	305	4	"	....	244	4	61	..	"
Beauty of Hebron	303	36	303	36	"	....	258	6	45	30	Long rose.
Delaware	303	36	303	36	"	....	241	46	61	40	Oval white.

POTATOES—Test of Varieties—*Concluded.*

Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Burnaby Seedling	302	8	302	8	None	....	256	48	45	20	Long, pale rose.
Green Mountain	300	40	300	40	"	....	240	40	60	..	Oval white.
Seedling No. 23.......	300	40	300	40	"	....	180	40	120	..	Round, white purple eyes.
Carman No. 1........	299	12	299	12	"	....	240	32	58	40	Oval white.
Polaris	297	44	297	44	"	....	267	14	30	30	Long white.
Thorburn	296	22	296	22	"	....	243	22	53	..	" rose.
Orphans	294	4	294	4	"	....	240	4	54	..	" white.
Bovee.........	293	20	293	20	"	....	264	20	29	..	" rose.
Daisy...............	293	20	293	20	"	....	249	44	43	36	" "
Early Rose	290	25	290	20	"	....	235	20	55	..	" "
Lightning Express	286	..	257	30	28	30	201	30	56	..	" "
Hale's Champion......	284	32	270	2	14	30	170	30	99	32	Round white.
Queen of the Valley........	281	36	281	36	None	....	230	6	51	30	Oval pink.
85 Nameless..	277	12	277	12	"	....	223	12	54	..	Round white.
Seedling No. 25...........	271	20	271	20	"	....	218	50	52	30	Long white.
Freeman............... ...	271	20	271	20	"	....	203	35	67	45	"
Early Gem	271	20	271	20	"	....	203	35	67	45	Long rose.
I. X. L	266	..	238	..	26	..	180	..	58	..	" pink.
Hopeful....................	256	40	256	40	None	....	217	50	38	50	Oval white.
Seedling 214..............	256	40	256	40	"	....	205	..	51	40	Long "
King of the Roses.... ...	256	40	256	40	"	....	154	40	102	..	" pink.
Lizzie's Pride.............	249	20	249	20	"	....	176	20	73	..	" "
Fillbasket..................	244	36	244	36	"	....	197	56	45	40	" red.
Uncle Sam	234	40	234	40	"	....	222	46	11	44	Oval white.
Wonder of the World........	234	40	234	40	"	....	189	52	44	48	Long rose.
Pearce's Prize Winner......	234	40	234	40	"	....	176	40	58	40	" pale rose.
Early Ohio	228	48	228	48	"	....	206	28	22	20	" pink.
Bruce's White Beauty......	228	48	228	48	"	....	171	36	57	12	Oval white.
Burpee's Extra Early.......	228	48	228	48	"	....	170	..	58	48	Long rose.
General Gordon............	225	52	218	52	12	30	168	22	45	..	" red.
Early Six Weeks	205	20	205	20	None	....	184	..	21	20	" pink.
Maggie Murphy	205	20	205	20	"	....	162	50	42	30	" rose.
Lawton's White............	202	24	202	24	"	....	181	54	20	30	" white.
Harbinger	176	..	176	..	"	....	151	..	25	..	" rose.
Vanguard..................	176	..	176	..	"	....	143	40	32	20	" pink.
Table King..	176	..	176	..	"	....	140	45	35	15	Round white.

YIELD OF HAY, FODDER CROPS AND ROOTS.

Hay, first crop..............	12 tons	1,000	lbs.
" second crop..........................	9 "	1,000	"
Mixed grain, cut for feed......	40 "	1,215	"
Turnips..................................	72 "	1,500	"
Carrots.....	15 "	1,700	"
Mangels.	17 "	1,500	"
Sugar beets..............	5 "	......	
Clover, in silo..........................	3 "	......	
Corn, in silo............	51 "	......	

The first crop of clover was cut in June, the second in August. A considerable portion of the clover, both first and second crop, was cut and fed green.

EXPERIMENTS WITH FODDER CROPS.

These plots were sown on loam which had been in roots the previous year and was in very good condition. The Egyptian Lentils, Teosinte, Kaffir Corn, Hungarian Grass and Golden Wonder Millet did not prove worth cutting.

Fodder Crops.	Date of Sowing.	Character of Growth.	Weight per Acre, Green.	Weight per Acre, Cured.	Remarks.
			Tons. Lbs.	Tons. Lbs.	
Mixture No. 1—1 bush. each wheat, oats and pease......	May 1	Strong..	9 900	4 500	Cut Aug. 2nd, wheat in late milk.
Mixture No. 2—1 bush. each oats, pease and barley.....	" 1	" ..	8 1,950	3 1,450	" oats in milk.
Golden Millet..............	April 27	" ..	Not weighed green.....	3 1,140	Cut when grain was in late milk.
New Siberian Millet	" 27	" ..	" ..	3 1,240	" "
Holy Terror Millet..........	" 27	" ..	" ..	4 140	" "
New Mammoth Millet	" 27	" ..	" ..	3 1,550	" "
Hungarian Grass............	May 18	....	....	....	Seed did not germinate well, very few plants
Golden Wonder Millet......	" 18	....	....	....	" "
Egyptian Lentils............	April 27	....	....	....	Only a few seeds germinated, growth very feeble and no pods formed.
White Kaffir Corn	" 27	....	....	....	Only a few seeds germinated, growth from 6 to 10 inches high.
Teosinte	" 27	....	....	....	Only a few seeds germinated, growth from 3 to 5 inches high.

DISTRIBUTION OF SEED GRAIN, &c.

The following is a summary of the distribution of seed grain, plants, scions and cuttings made during 1897 :—

Wheat, 3-lb. bags........	51
Oats "	57
Barley "	29
Pease "	49
Potatoes "	68
Lathyrus Sylvestris, packages........	42
Scions "	105
Cuttings "	63
Small fruits "	71
Tree seeds "	150
Total	685

STOCK.

Since cool weather began three bulls have shown symptoms of the red water. They have been promptly treated and the disease arrested.

These animals have always had comfortable quarters, wholesome food and pure water, which makes it difficult to assign a cause, and, until a cause is found, difficult to prevent.

There are at present on the farm six head of horses, twenty head of cattle, four pigs, seven sheep, and forty-one fowls.

All—with the exceptions above mentioned—are in apparent good health.

BUILDINGS.

A small comfortable shed for shelter has been put up in each of the bull yards.

FENCING.

About three-quarters of a mile of wire fence has been put up along the west side of the farm, and a strip of land is being cleared along this to protect it from fire.

LARGE FRUITS.

APPLES.

The crop of apples has been a very heavy one, and the quality very fine, there being less scab and other fungus diseases than usual, and no injury from insects. The apple miner, which did considerable damage to the fruit last year, has been entirely absent this year. Whether their absence this season is because the injured fruit was carefully gathered and fed to the stock, and the trees sprayed, during the growing season with Bordeaux mixture and Paris green, and in winter with the lime sulphur and salt mixture, or from some other cause, is not known. The following apples fruited for the first time this year:—

Devonshire Quarrenden.—Tree a moderate grower. Fruit medium size, roundish and flattened. Skin deep rich crimson, with small green dots. Flesh white, crisp, juicy; pleasant sub-acid flavour. Season, August.

Summer Red Streak.—Tree a moderate grower. Fruit medium size, roundish conical. Skin yellow, splashed and striped with red. Flesh white, juicy, brisk sub-acid. Season, August.

Grandmother.—Tree an upright vigorous grower. Fruit above medium size, nearly conical. Skin greenish yellow, splashed and streaked with red. Flesh dry, granular and sweet. Season, last of August.

Bogdanoff.—Tree a strong grower. Fruit round, flattened, above medium size. Skin yellow, with a bright red cheek. Flesh white, juicy, sprightly acid. Season, September.

Borovinka (Solovieff).—Tree vigorous. Fruit of the Duchess type, only nearly twice as large. Season, September.

Gipsy Girl.—Tree a strong grower. Fruit large, obovate. Skin yellow, splashed with bright red. Flesh white, juicy, crisp, sprightly acid. Season, September and October.

No. 181.—Tree a vigorous grower. Fruit large, roundish, conical. Skin greenish, yellow. Flesh white, juicy, mild acid. Season, last of September.

Volga Anis.—Tree a strong grower. Fruit large, oblong conical. Skin greenish yellow, with a red blush. Flesh white, coarse, mild sub-acid. Season, October.

Haskell's Sweet.—Tree a vigorous grower. Fruit of medium size, round flattened. Skin greenish yellow, with a blush in the sun. Flesh yellowish, tender, medium, juicy and pleasant. Season, October.

King of Pippins.—Tree a strong grower. Fruit of medium size, roundish. Skin, pale yellow, splashed with red. Flesh firm and sharply acid. Season, October and November.

Somnitelnoe.—Tree a vigorous grower. Fruit small, conical. Skin green, nearly covered with bright red. Flesh white, not juicy or high flavoured. Season, September and October.

Karabovka.—Tree a very vigorous grower. Fruit small, obovate,conical. Skin green splashed with red. Flesh white, medium juicy, sub-acid. Season, September and October.

Titovka (Solovieff).—Tree a very vigorous grower. Fruit large, oblong conical. Skin greenish yellow, with streaks of red on sunny side. Flesh white, medium juicy, mildly acid and pleasant. Season, late autumn.

Pladovitka (Solovieff).—Tree a very vigorous, grower. Fruit of medium size, roundish flat. Skin green, splashed with red. Flesh white, juicy, crisp, pleasant acid. Season, late autumn.

Lapough.—Tree a very vigorous grower. Fruit large. Skin clear waxy yellow. Flesh white, crisp, juicy, sprightly acid. Season, late autumn.

Zolotoreff.—Tree a very vigorous grower. Fruit large, roundish, conical. Skin greenish yellow, with a reddish cheek. Flesh white, tender, juicy, sprightly acid. Season, late autumn.

Borsdorf.—Tree a strong and vigorous grower. Fruit of medium size, oblong, tapering to the eye. Skin greenish white, with a little russet. Flesh yellowish white, crisp, juicy, sub-acid. Season, late autumn.

Cox's Orange Pippin.—Tree a moderate and spreading grower. Fruit of medium size, oblate. Skin yellow, splashed, nearly over the whole surface with red. Flesh yellowish, crisp, juicy, rich sub-acid. Season, late autumn.

Melonen.—Tree vigorous. Fruit large, roundish conical. Skin yellow, with a pink blush. Flesh yellowish, crisp, medium juicy, mild acid. Season, autumn.

Calville Saint Sauveur.—Tree a medium grower. Fruit large, oblong conical. Skin greenish yellow, somewhat mottled and sprinkled with whitish dots. Flesh white, tender and juicy, acid. Season, late autumn.

Perry Russet.—Tree a strong grower. Fruit large, oblong. Skin yellow with russet nearly over the whole surface. Flesh, yellow, firm, juicy, pleasant acid. Season, late autumn.

Huntsman's Favourite.—Tree a vigorous grower. Fruit large, roundish conical, Skin greenish yellow with a little pale red on cheek. Flesh yellowish, coarse, crisp. juicy, and of pleasant flavour. Season November and December.

Carthouse.—Tree vigorous. Fruit large. Skin smooth, yellow, streaked with red. Flesh yellow, firm, juicy and fine. Season, winter.

Plum's Cider.—Tree a vigorous grower. Fruit of medium size, oblong. Skin yellow with a little russet, and sprinkled with gray dots. Flesh yellow, tender, juicy and mild, sub-acid. Season, winter.

Switzer.—Tree a moderately vigorous grower. Fruit small to medium, roundish, flattened. Skin green, nearly covered with dark red. Flesh white, firm, juicy, mild, sub-acid, and of pleasant flavour. Season, winter.

Iowa Blush.—Tree vigorous. Fruit of medium size, conical. Skin yellow, with a mottled yellowish red cheek. Flesh white, firm, juicy, mild acid. Season, winter.

Willow Twig.—Tree a medium but spreading grower. Fruit of medium size, roundish, slightly conical. Skin green, streaked and splashed with light red. Flesh greenish white, firm, juicy, pleasant sub-acid. Season, winter.

Scarlet Cranberry.—Tree a medium grower. Fruit small to medium, oblate. Skin green, nearly covered with dull red and freely sprinkled with whitish dots. Flesh yellowish white, firm and juicy, mild, sub-acid. Season, winter.

The list of varieties given last year as the most promising for winter have produced fine crops of apples this season, and that list may be extended by adding Smith's Cider and Stark. Smith's Cider is a strong, vigorous and productive tree, with fruit of medium size, handsome and of good quality, keeping until last of February.

Stark.—Tree a very strong grower and productive. Fruit large and of fair quality, keeping until last of March. Specimens have been kept until last of June.

PEARS.

The season has been a very favourable one for pears and the crop not only a large one but the quality was very fine.

Several of the newer varieties fruited for the first time this year. Below will be found some notes giving date of ripening and quality so far as an opinion can be formed from the first year's crop.

Salviate.—Tree a vigorous grower. Fruit of medium size, obovate, pyriform ; skin greenish yellow with a few gray dots. Flesh dry, granular and poor. Ripe, 1st. August.

Wilder.—Tree a vigorous upright grower. Fruit large, obtuse, pyriform. Skin bright yellow, with a warm blush on sunny side. Flesh yellowish, juicy and sweet. Ripe August 4th.

Ritson.—Tree a strong grower. Fruit small to medium, oblong, pyriform. Skin yellow, sprinkled with russet. Flesh white, juicy, buttery. Ripe, last of August.

La France.—Tree a vigorous grower. Fruit of medium size, obovate, obtuse, pyriform. Skin green, with small gray dots. Flesh juicy, melting and of very fine flavour. Season September.

Jargonelle.—Tree a vigorous grower. Fruit large, long pyriform. Skin greenish yellow with a little bronze on cheek. Flesh juicy, white pleasant. Season, August.

Early Bergamot.—Tree a medium grower. Fruit small, roundish, pyriform. Skin yellowish green. Flesh sweet, pleasant but not juicy. Season August.

Comte de Lamy.—Tree a vigorous grower. Fruit small to medium in size, oblate, pyriform. Skin yellow with a reddish cheek and small patches of russet. Flesh white, fine grained, buttery and sweet. Season, September.

Beurre d'Amanlis.—Tree a strong grower. Fruit of medium size, obovate, pyriform. Skin green with a reddish brown cheek and many brown dots. Flesh juicy, with a pleasant flavour. Season, September.

Madame Treyve.—Tree a vigorous grower. Fruit of medium size, obovate, pyriform. Skin yellow, with a red cheek and small brown dots. Flesh white, melting, juicy, sweet, with a rich flavour. Season, September.

Jersey Gratioli.—Tree a medium grower ; fruit of medium size, obovate pyriform. Skin yellowish green with patches of russet. Flesh white, juicy and melting. Season, September.

Pitmaston Duchess.—Tree a vigorous grower. Fruit large, oblong pyriform. Skin yellow with russet near the stalk. Flesh yellowish, juicy, buttery, and of pleasant flavour. Season, October.

Gansel's Bergamot.—Tree a moderate grower ; fruit of large size, roundish, obovate, nearly flat. Skin russet brown, with a russet red cheek. Flesh white, juicy, melting, and sweet with a rich flavour. Season, September.

Conseiller de la Cour.—Tree a vigorous grower. Fruit above medium size, oblong, pyriform. Skin greenish yellow with russet dots. Flesh yellowish, juicy and melting. Season, last of September.

General Todtleben.—Tree a vigorous, spreading grower. Fruit large, obtuse, pyriform. Skin greenish yellow, sprinkled with russet dots; flesh whitish, coarse, juicy, sweet and pleasant. Season, October.

Nouvelle Fulvie.—Tree a medium grower. Fruit large, pyriform. Skin greenish yellow with a reddish brown cheek. Flesh yellowish, juicy, melting, sweet. Season, October.

Noveau Poiteau.—Tree a vigorous grower. Fruit of medium size, obovate, pyriform. skin greenish yellow; flesh whitish, buttery, juicy, with a rich sweet flavour. Season November.

Of the new pears the Dr. Jules Guyot, for early autumn. Rivers' Princess, Pitmaston Duchess and Knight's Monarch appear to be the most promising. More than thirty varieties of pears new to our collection were received as scions this year.

PLUMS.

This climate is so suitable to the plum that a crop of fruit is almost certain if the trees have received even ordinary care. This season the crop has been a fairly good one and some varieties gave very heavy crops. Several of the newer sorts fruited this year, as follows:—

Early Favourite.—Tree a vigorous grower, but not an early bearer. Fruit small, roundish, oval. Skin nearly black with a blue bloom. Flesh greenish yellow, juicy, sweet, and of high flavour. Stone small and free. Ripe, 22nd July.

Early Prolific.—Tree a moderate grower, but not prolific here. Fruit small, nearly globular. Skin dark purple with a blue bloom. Flesh yellowish, juicy and sweet. Stone small and free. Ripe, 26th July.

Lincoln.—Tree a strong grower. Fruit large, oval. Skin reddish purple with many whitish dots and a thin white bloom. Flesh yellow, juicy, sweet and pleasant. Stone small. Ripe, 6th August.

July Green Gage.—Tree a moderate grower. Fruit of medium size, globular in shape. Skin yellow, with many small crimson dots. Flesh yellow, juicy, sweet. Ripe, 7th August.

Mariana.—Tree a moderate grower. Fruit small, oval. Skin glossy, yellow, with a reddish blush on sunny side. Flesh yellow, juicy and pleasant. Stone cling and large. Ripe, 10th August.

Goliath.—Tree a strong grower. Fruit large, roundish, oblong, one side enlarged, suture shallow. Skin reddish purple, with a thin whitish bloom. Flesh yellow, with a brisk pleasant flavour. Clingstone. Ripe, 10th August.

Angelina Burdette.—Tree a strong grower. Fruit above medium size, nearly round, with a deep suture and one side enlarged. Skin dark purple with brown dots and a blue bloom. Flesh greenish yellow, juicy, with a sprightly, pleasant flavour. Free stone. Ripe, 10th August.

Wooten.—Tree a moderately vigorous grower. Fruit small. Skin yellow, with a reddish blush nearly over the whole surface. Flesh yellow, juicy and pleasant. Clingstone. Ripe 10th August.

Early Red.—Tree a feeble straggling grower. Fruit, small oval. Skin, dark purple, with a heavy blue bloom; flesh, light greenish white, dry granular and acid; ripe, 10th August.

Golden Beauty.—Tree a fair grower. Fruit small, nearly heart shaped. Skin red, sprinkled with whitish dots, and a thin whitish bloom. Flesh yellow, juicy and sweet; clingstone. Ripe, 12th August.

Transparent Gage.—Tree a strong grower. Fruit of medium size, round, flattened. Skin light green with a light red blush, and a whitish bloom. Flesh greenish white, juicy, sweet and of fine flavour, but cracks badly. Ripe, 14th August.

Prince Englebert.—Tree a strong, vigorous grower. Fruit of medium size, oblong oval. Skin dark purple with brown dots and a light blue bloom. Flesh greenish yellow, sweet, juicy and firm. Stone large, and cling. Ripe, 14th August.

Robinson.—Tree a vigorous grower. Fruit small. Skin yellow with a bright red side. Flesh yellow, juicy and sprightly. Stone large, and cling. Ripe, 14th August.

McLaughlin.—Tree a strong grower. Fruit above medium, round and quite flattened. Skin greenish yellow, and dotted with reddish dots about the stem. Flesh yellow, firm, juicy, sweet, and of very rich flavour. Stone small, and cling. Ripe, 16th August.

Orleans Old.—Tree a moderate grower. Fruit below medium size, globular, with a shallow suture. Skin dark purple, with a dark, blue bloom. Flesh yellowish, sweet, juicy, pleasant. Ripe, 16th August.

Glass Seedling.—Tree a free grower. Fruit above medium size, oval, suture broad and shallow, one side enlarged. Skin dark purple with a blue bloom. Flesh greenish yellow, firm, juicy, sweet; free stone. Ripe, 19th August.

Giant Prune.—Tree a free grower. Fruit large, oblong, with a shallow suture. Skin yellow nearly covered with light red and a thin whitish bloom. Flesh yellowish, juicy, sweet and rich. Ripe, 20th August.

McGillivray.—Tree a moderate grower and poor producer. Fruit small, oval shape, shin light red. Flesh yellow, juicy, slightly astringent; cling stone. Ripe, 20th August.

Field.—Tree a vigorous grower. Fruit above medium in size, oblong with a deep suture. Skin purple with a thin blue bloom. Flesh greenish, sweet, firm and of pleasant flavour. Stone large, cling. Ripe, 20th August.

Tenant Prune.—Tree a strong vigorous grower. Fruit medium to large oblong with a shallow suture. Skin reddish purple with a whitish bloom. Flesh yellow, firm, sweet and pleasant. Stone small and free. Ripe, 22nd August.

Annie Spathe.—Tree vigorous. Fruit small oval with a shallow suture. Skin reddish purple with a thin bluish bloom. Flesh greenish yellow, sprightly and of pleasant flavour. Stone large. Ripe, 24th August.

Several of the Japanese plums fruited this year, but the fruit almost all fell off before fully grown.

Botan.—Tree a straggling poor grower. Fruit of medium size, pointed heart-shape. Colour bright red sprinkled with grayish dots and covered with a thin white bloom. Flesh yellow, juicy, crisp, and of pleasant flavour. Ripe, 7th August.

Ogon.—Tree a medium grower. Fruit large, nearly round. Skin yellow with a thin bloom. Flesh yellow, firm, sweetish and dry. Ripe, 17th August.

Burbank.—Tree a straggling grower. Fruit large, roundish conical. Skin yellowish red. Flesh yellow, moderately juicy, sweetish, not a pleasant flavour. Stone small and free. Ripe, 16th August.

Red Negate.—Tree a feeble straggling grower. Fruit of medium size, pointed heart-shape. Skin bright red with a thin bloom. Flesh yellow, juicy, sprightly, but not a good flavour. Ripe, 16th August.

Grand Duke, *Gueii*, *Monarch*, *Cox's Emperor* and *Lincoln* are the most profitable varieties among those which have fruited for two years or more. Several others are promising but have not been tested long enough to prove them thoroughly.

The Japan plums bloom very freely, but do not set their fruit well, and the trees are without exception lacking in growth and vigour.

Nineteen varieties of plums have been added to the collection this year.

CHERRIES.

The cherry trees bloomed freely this year and set a fine crop of fruit which, unfortunately, suffered very severely from the wet weather, which occurred when many of the varieties were nearly ripe, causing the fruit to split and rot.

Of those that have fruited in previous years, one of the most satisfactory is the Windsor, which gave a fine crop during the past season, and the fruit did not receive so much injury from the wet weather as other varieties of the same season.

Early Rivers.—Fruited this year for the first time. Fruit large, roundish, heart shaped. Skin, nearly black. Stalk, long. Stone, small. Flesh, tender, juicy and sweet. Ripe, 26th May.

White Heart.—Fruit small, heart-shaped. Skin, yellowish white with a pale reddish cheek. Flesh, melting, sweet and pleasant. Ripe, 5th June.

Schmidt's Bigarreau.—Fruit large, nearly round. Skin, nearly black. Flesh firm, juicy and of fine flavour. Ripe, 1st July.

Sparhawk's Honey.—Fruit of medium size, roundish, heart shaped. Skin, yellowish red. Flesh juicy, sweet, and of fine flavour. Ripe, 1st July.

Straus Weichsel.—Fruit large, nearly black, round, a little flattened. Flesh dark red, juicy, firm, slightly acid, of good flavour. Ripe, 1st July.

Nouvelle Royale.—Fruit large, roundish. Skin, bright glossy red, mottled with darker red spots. Flesh white, firm, juicy, pleasant and sprightly. Ripe, 2nd July.

Gruner Glass.—Fruit of medium size, nearly round. Skin dark red, or nearly black. Flesh firm, juicy, sprightly. Ripe, 5th July.

Arch Duke.—Fruit large, obtuse, heart-shaped. Skin, dark red. Flesh tender, juicy and high flavoured, sprightly, sub-acid. Ripe, 5th July.

Royal Duke.—Fruit large, roundish, flattened. Skin, dark red. Flesh reddish, tender, juicy, with a rich flavour. Ripe, 1st to 6th July.

Griotte du Nord.—Fruit small to medium, somewhat oval in shape. Skin light red. Flesh reddish white, juicy, acid. Stone, large. Ripe, 13th July.

Brusseler Braun.—Fruit of medium size, oval shape. Skin, deep red. Flesh reddish white, juicy, firm, pleasant acid. Ripe, 10th to 15th July.

Montmorency Court Queue.—Fruit above medium in size, round flattened. Skin light red. Flesh yellowish, tender, juicy, pleasant acid, very fine flavour, a little soft. Ripe, 5th to 10th July.

Duchess de Pallau.—Fruit large, nearly round. Skin bright red. Flesh yellowish white, firm, solid, and moderately juicy, mild, pleasantly acid, with a fine flavour. Ripe, 10th to 14th July.

Eleven varieties of cherries have been added to our collection this season.

Dwarf Rocky Mt. Cherries.—These bushes fruited freely this season, ripening about the last of August, the fruit hanging on the bushes in good condition for some weeks. A number of seedlings have been raised for distribution; as this fruit can be grown in the interior, where other cherries are not hardy, and under such conditions may be of value.

PEACHES.

Several varieties of peaches fruited fairly well, especially in sheltered locations, but they have not thus far been profitable to plant here for commercial purposes.

The following varieties produced a small crop this season. They are listed in the order of ripening.

Amsden, Early Canada, Hilborn, Crane's Early Yellow, Early Rivers, Mountain Rose, Barnard's New Rare Ripe, Foster, Early Barnard, Muir, Amelia, Druid Hill, Hill's Chili, Fox's Seedling. The above all ripened their fruit. Several of the varieties mentioned in my last report as not ripening their fruit, fruited again this year, but the fruit did not ripen or fully mature.

NECTARINES.

Many of the older nectarine trees blossomed freely, but none of them set more than two or three fruits. Nectarines, like peaches and apricots, do not appear to be well adapted to this climate.

APRICOTS.

Although nearly all the apricot trees bloomed freely the fruit did not set. Alexander, Alexis, Catherine, J. L. Budd, and Montgamet, each produced from two to half a dozen apricots, but the fruit was imperfect and poor. The apricot trees do not appear to be hardy, as large limbs die from time to time, and blossoming very early, as they do, the fruit does not set.

MULBERRIES.

All the mulberry trees fruited freely this year. The fruit began ripening the last of July and continued until the first of September. The fruit is large, sweet and juicy, and is produced in considerable quantities on the trees, but it falls off as soon as ripe, and is too soft for any but a home market.

QUINCES.

The quinces blossomed this year, but no fruit set.

FIGS.

The fig bushes continue to grow, but as they are frequently cut back in winter, and no ripe fruit has been produced, they are not of much value.

MEDLARS.

The Royal, Nottingham, and Holland medlar trees, fruited this year, but the trees evidently require age before the fruit is produced in quantity.

NUT TREES.

Filberts did not fruit freely this season, but a few very fine nuts were produced on the bushes got from Germany last year, and when these bushes have attained size, some desirable varieties, for this climate, may be found amongst them.

The Japanese walnut had a few fine nuts this season, and the hard shell almonds again fruited. The soft shell varieties have not yet fruited.

GRAPES.

The crop of grapes on the farm this season has been very small. Owing to the constant rain during the time they were in blossom, fertilization was imperfect, and consequently the bunches were open and not half the number of grapes in a bunch which there were last year, and a great many of the grapes were small in size and imperfect.

White or Nearly White.

Date of Ripening.

October 1.—Storr's Early.—Sweet, juicy, and of pleasant flavour; a very small crop.
" 3.—Duchess.—Sweet and juicy, but not so good in flavour as last year; a few bunches only.
" 4.—Lady.—Tender juicy and sweet, but very few bunches.
" 4.—Emerald.—Sweet, tender, good flavour; fair crop.
" 4.—Saunders' Seedling, No. 3.—A fair crop of very good grapes; sweet, tender and juicy.
" 4.—Eva.—Grape tender and juicy, a very poor crop.
" 6.—Saunders' Seedling.—(Wild seedling with Muscat Hamburg.)—A fair crop of very good grapes; sweet, juicy and tender.
" 6.—Jessica.—A very few bunches; grapes much inferior to other years.
" 6.—Martha.—A fair crop of nice grapes; a little acid, but juicy and of good flavour.
" 8.—Rommel.—Grape juicy, sprightly, pleasant flavour; a few bunches
" 8.—Pocklington.—Grape pulpy, sprightly, pleasant flavour; a poor crop.
" 13.—Eldorado.—Grape very uneven in size, sweet, skin thick; a very few bunches.
" 13.—Missouri Reisling.—A fairly good crop of juicy tender grapes.
" 13.—Centennial.—A good crop of worthless grapes.
" 13.—Niagara.—A very fair crop of good grapes.
" 13.—Saunders' Seedling.—(Wild seedling with Muscat d'Aout.)—A medium crop of very good grapes, but uneven in size, and many of the grapes dropped off the bunch when ripe.
" 24.—Lady Washington.—Only a few bunches of rather inferior grapes.
" 26.—Elvira.—A fair crop; juicy, tender grapes, but many were imperfect.
" 26.—Noah.—Only a few bunches of very imperfect grapes.
" 29.—Opal.—A few bunches of sour imperfect grapes.

Black or very Dark Blue.

October 4.—Bacchus.—Three or four bunches of poor grapes.
" 4.—Early Victor.—A few bunches of small sweet grapes of rather poor flavour.
" 4.—Florence.—A fair crop of worthless grapes.
" 4.—Cottage.—A small crop of fairly good grapes; sweet and of good flavour.
" 7.—Improved Wild.—A very few bunches of poor grapes.
" 7.—Cynthiana.—A fair crop of worthless grapes.
" 7.—Moore's Early.—A fair crop; grape sweet, pulpy, skin tough.

Black or Dark Purple.

October 9.—Canada.—A fair crop; grape small, sweet, but not of good flavour.
" 10.—Roger's No. 39.—Grape large, sweet and pulpy; a poor crop.
" 10.—Merrimac (Roger's No. 19.)—Grape large, juicy, sweet and of good flavour; a fair crop.
" 10.—Wilder.—A small crop of large, juicy and sweet grapes.

Date of Ripening.

October 12.—Roger's No. 24.—A fair crop; grape pulpy, rather acid, skin tough.
" 12.—Clinton.—A good crop of good grapes.
" 14.—Herbert (Roger's No. 44.)—A poor crop of rather inferior grapes.
" 15.—Naomi.—A very few bunches of worthless grapes.
" 15.—Saunder's Seedling (Clinton with Muscat Hamburg.)—A small crop of very good grapes, juicy and a little acid.
" 15.—Saunder's Seedling (Concord with Delaware.)—A fair crop of good grapes, juicy, sprightly, good flavour.
" 15.—America.—Bunch small; grapes medium in size, juicy, sour, poor flavour; a poor crop.
" 15.—Oriental.—A good crop; grape juicy, sprightly, and of fair quality.
" 15.—Dr. Collier.—Bunch large and loose; grape medium in size, sour, juicy, poor flavour; grape uneven in size.
" 18.—Marion.—A few bunches of very inferior grapes.
" 18.—Hartford.—A few bunches of inferior grapes.
" 20.—Mills.—A small crop of very poor grapes.
" 20.—Highland.—A fair crop, but grapes rather inferior, and a great many imperfect grapes in bunch.
" 20.—Roger's No. 41.—A good crop; grape large, pulpy and of pleasant flavour.
" 22.—Arnold's No. 8.—A few bunches of worthless grapes.
" 22.—Eumelan.—A small crop of very poor grapes.
" 27.—Arnold's No. 2.—A few bunches of poor grapes.
" 27.—Seedling (Clinton with Muscat Hamburg.)—Grape small and acid; a few bunches.

Red and Reddish.

October 2.—Delaware.—A fair crop of good grapes, small, sweet and of good flavour.
" 3.—Roger's No. 5.—A small crop; grape large, juicy, sprightly, skin tough.
" 3.—Moyer.—A very few bunches. Grape small, sweet, juicy and pleasant.
" 3.—Wyoming Red.—A fair crop of very good grapes; medium sized, juicy, and of pleasant flavour.
" 5.—Brillant.—A small crop; grape medium size, sweet, juicy and tender.
" 5.—Ulster.—A fair crop; grape sweet, juicy and of good flavour.
" 5.—Vergennes.—A fair crop of pretty good grapes, pulpy, sweet and of good flavour.
" 10.—Buchanan.—A fair crop; grape juicy, sprightly, of good flavour; skin thin.
" 10.—Chasselas De Fontainbleau.—A fair crop; grape medium in size, pulpy, sweet and pleasant.
" 13.—Lindley (Roger's No. 9).—A few bunches; grape juicy and sweet.
" 13.—Salem (Roger's No. 53).—A few bunches; grape large, juicy and sweet.
" 15.—Amber Queen.—A very few bunches of worthless grapes.
" 15.—Massasoit.—A few bunches; grape juicy, sweet and tender.
" 18.—August Giant.—A small crop of fine looking grapes, but acid, juicy and of poor flavour.
" 18.—Agawam.—A small crop; grape tender, juicy and pleasant.
" 18.—Gærtner (Roger's 14).—A few bunches; grape juicy, sweet, tender and of pleasant flavour.
" 18.—Brighton.—A few bunches of poor grapes.
" 18.—Arnold's No. 1.—A good crop of sour grapes.
Jefferson.—A few bunches; grape medium in size; not ripe 31st October.
Catawba.—A good crop; grape large, but bunch loose and open; not ripe 31st October.

SMALL FRUITS.

Nearly all the small fruits were transplanted this spring to a more suitable piece of land. The soil where they had been growing was a dry gravelly knoll and was not suitable, but it was the best land available at the time many of the bushes were received. In consequence of their removal only a small crop was produced this season but there was already a considerable improvement in the size and quality of the fruit.

GOOSEBERRIES.

The only gooseberry bushes that fruited this year were those on the mountain, and as in previous years these were clean and free from mildew both in fruit and foliage. The bushes on the level had been transplanted early in spring and cut back, and did not fruit. The foliage in some varieties was rather badly attacked with mildew. The Bordeux mixture does not appear to be entirely successful here with this form of mildew and other mixtures are being tried, and it is hoped that some more efficient remedy will be found to preserve this desirable fruit.

CURRANTS.

RED AND WHITE CURRANTS.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Verriers (white)	June 25	Vigorous ...	Large	Long cluster; sweet; very fine flavour.	Productive.
La Turmoise (red.)	" 25	" ...	" medium	Cluster, medium in length; good flavour, but rather acid	Fairly productive.
Champagner (white.)	" 25	Moderately vigorous.	Small........	Cluster, medium in length; sweet; good flavour.	Moderately productive.
Champagner (red.)	" 25	Vigorous ...	Large medium	Cluster, medium in length; rather acid; good flavour.	" "
Admirable (red)	" 25	" ...	"	Cluster, rather long; good flavour; very mild acid.	" "
English Red....	" 25	" ...	"	Cluster, long; fine flavour; acid.	Fairly productive.
Brandenburger (white.)	" 25	" ...	"	Cluster, medium in length; flavour good; mild acid.	Productive.
Red Cherry (German)....	" 25	" ...	"	Cluster, medium in length; sweet; good flavour.	Not productive.
Raby Castle (red.)	" 25	" ...	" medium	Cluster, medium in length; a little acid, but of good flavour.	Moderately productive.
London Red ...	" 25	" ...	" "	Cluster, rather short; not very good.	Not productive.
White Transparent.	" 25	" ...	" "	Cluster, medium in length; a good currant; sweet.	Moderately productive.
La Fertile (red).	" 25	Very vigorous.	"	Cluster, long and full; sweet; of good flavour; one of the best.	Very productive.
Red Cherry....	" 25	Vigorous ...	Medium......	Cluster, short to medium; fruit rather insipid.	Not very productive.
Red Dutch...	" 25	" ...	Large	Cluster, medium in length; a good currant.	Productive.
White Gondoin	" 25	" ...	" medium	Cluster, medium in length; sweet; good flavour.	Moderately productive.
La Hative......	" 25	" ...	Medium.. ...	Cluster, long and fairly full; fine quality; not too acid.	Productive.
Knight's Early.	" 25	" ...	"	Cluster, medium in length; flavour good.	Moderately productive.

RED AND WHITE CURRANTS—*Concluded.*

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
New Red Dutch	June 25	Vigorous ...	Above medium	Cluster, long and well filled; good flavour; a little acid.	Moderately productive.
Esperen's White	" 26	" ...	Large	Cluster, medium in length; currant sweet; good flavour	Fairly productive.
Large White...	" 26	" ...	"	Cluster, long and well filled; yellowish white; sweet and very good flavour.	Productive.
Ranker's Red ..	" 26	" ...	" medium	Cluster, medium in length; very fine flavour.	Fairly productive.
Chenonceau (red.)	" 26	" ...	"	Cluster, medium in length; very fine flavour.	Productive.
Ringens (red)..	" 26	" ..	Small.........	Cluster, short; good flavour.	Moderately productive.
White Cherry..	" 26	" ...	"	Cluster, short; sweet; good flavour.	Not very productive.
La Conde	" 26	" ...	Medium	Cluster, long and well filled; very good quality.	Productive.
Red Langtraubige.	" 27	" ...	Large medium	Cluster, medium in length; fine flavour.	"
Beauty of St. Gilles.	" 27	" ...	"	Cluster, medium in length; rather acid, but of good flavour.	Moderately productive.
Red Dutch	" 27	" ...	"	Cluster, medium in length; rather acid, but of good flavour.	"
Eyatt's Novo (red.)	" 28	" ...	Medium......	Cluster, medium in length; flavour good, but rather acid	Fairly productive.
White Pearl....	" 28	Feeble......	Small....	Cluster, short; acid.	Not productive.
De la Rochepoze (red.)	" 29	Moderately vigorous.	"	A few inferior currants.	"
No. 51 (white)..	" 29	" ..	"	Cluster, short; acid.	Not very productive.
Large Red.....	" 29	Vigorous ...	Medium.. ..	Cluster, medium in length; good flavour.	Fairly productive.
Large White Dessert.	July 1	" ...	Large	Cluster, medium in length; acid, but fine flavour.	" "

BLACK CURRANTS.

Dominion......	July 1	Vigorous ...	Above medium	Fine mild flavour............	Productive.
London	" 1	" ...	Large medium	Mild, sweet, good flavour	"
Success	" 1	" ...	Small medium	Sweet mild flavour...........	"
Eagle..........	" 1	" ...	Large medium	Flavour a little strong	Fairly productive.
Baldwin........	" 1	" ...	Large	Sweet mild flavour....... ...	Productive.
Prince of Wales	" 1	" ...	"	A very fine currant; flavour sweet and mild...........	Moderately productive.
Stewart	" 1	" ...	Above medium	Flavour good..........	Productive.
Ruler..........	" 1	" ...	Large	Mild sweet flavour.	"
Morton........	" 1	" ...	"	Sweet mild flavour...........	"
Beauty	" 3	" ...	Small medium	Flavour fairly good....	Fairly productive.
Ontario........	" 3	" ...	Small	Flavour strong	Moderately productive.
Wood..........	" 4	" ...	Above medium	Rather strong flavour........	" "
Louise.........	" 5	" ...	"	Flavour strong..............	" "
Bella	" 5	" ...	Small	Acid, but of good flavour	Productive.
Eclipse	" 5	" ...	Above medium	" "	Fairly productive.
Pearce........	" 5	" ...	Small	Sweet mild flavour..........	" "
Black Naples...	" 5	" ...	Large	" "	Productive.
Ethel..........	" 7	" ...	Small	Acid and rather strong flavour	Moderately productive.
Monarch	" 7	" ...	Medium......	Acid, but mild and good flavour	" "
Kentville	" 8	" ...	Small	Strong flavour	Fairly productive.
Champion......	" 8	" ...	Small medium	Flavour rather strong........	" "

Black currant bushes which made vigorous growth but did not produce any fruit this year: Star, Tree Currant, Charmer, Lanark, Cranelle, Ogden's Black, Sterling, Henry, Climax, Oxford, Parker, Middlesex, Lee's Prolific, Manitoba Wild, Victoria Ambrafarbige, Kentish Hero, Gewonliche, Bang Up, Merveille de la Gironde, Lennox, Lewis.

RASPBERRIES.—RED AND YELLOW RASPBERRIES.

Name.	Date of Ripening.	Growth of Bush.	Size of Fruit	Quality.	Productiveness.
Carter's Prolific	June 10	Vigorous			
Hornet	" 15	"	Large	Round, dark red, good flavour, but soft.	Productive.
Lord Beaconsfield	" 15	"			
Crimson Beauty	" 20	Moderately vigorous.	Medium	Round, bright red, not very good flavour.	"
Franconia	" 25	Vigorous	"	Round, dark red, fair flavour, soft.	"
Hansell	" 27	Moderately vigorous.	Small	Round, dark red, good flavour, rather soft	Very productive.
Col. Wilder	" 27	"	Above medium.	Round, pale yellow, flavour good, sweet.	Productive.
Red Herrenhauser	" 28	Vigorous	Medium	Round, dark red, fairly good flavour, rather soft.	Fairly productive.
Spineless Yellow	" 28	"	"	Pale yellow, fair flavour, soft.	Productive.
Clarke	" 28	"	Small to medium.	Light red, good flavour, but soft and crumbly.	"
Champlain	" 28	Moderately vigorous.	Above medium.	Round, yellow, sweet and of pleasant flavour, soft.	"
Heebner	" 28	Vigorous	Large	Sweet, good flavour, moderately firm	Very productive.
Golden Queen	" 28	"	"	Round, yellow, a very good berry, good flavour and firm.	Productive.
Turner	" 28	"	Small	Red, good flavour, but soft and crumbly.	Moderately productive.
Marlboro'	" 28	"	Large	Red, of good flavour and moderately firm.	"
Antwerp	" 28	"	Small	Round, dark red, fair flavour, soft.	Very productive.
London	" 30	"	Large	Round, red, very good flavour, firm; promises to be as good as the Cuthbert.	Productive.
Queen of the Market	July 1	"	Very large	Dark red, sweet, firm	"
Queen Victoria	" 1	"	Medium	Soft, crumbly, insipid	Moderately productive.
Duke of Brabant	" 1	"	"	Round, light red, sweet, good flavour, firm.	"
Cuthbert	" 1	"	Large	A very good berry, red, sweet, and good flavour, firm, and continues in bearing a long time.	Productive.
Belle de Fontenay	" 1	"	"	Long, conical, dark red, fairly firm.	Moderately productive.
Fastolf	" 1	"	"	Roundish conical, purplish red, of fine quality.	"
White Antwerp	" 1	"	Above medium.	Round, yellowish white, sweet, soft.	"
Paragon	" 3	"	Large	Round, bright red, good flavour, firm.	Productive.
Muskingum	" 4	"	Above medium.	Round, dark red, good flavour, firm.	Moderately productive.
Thompson	" 5	"	"	Round, bright red, good flavour, moderately firm.	"
Cromwell	" 8	"	Medium	Juicy, sweet, firm	Fairly productive.
Chili	" 8	"	"	Round, light red, large drupes, crumbly, of poor flavour.	Not very productive.
Arnold's Hybrid	" 8	"	"	Dark red, sweet and pleasant flavour, but soft.	Moderately productive.

The following raspberries are growing thriftily, but did not bear any fruit this year:—Large Yellow, New Fastolf, Beehive, Autumn Surprise, Yellow Antwerp, Barnet, Sarah, Malta, Shaffers Colossal, Carman, Oregon Late, Senator, Garnet, Craig, Garfield, Percy, Muriel, R. B. Whyte, Early Ohio, Miller, Billard's Perpetual, Lemercier, Conrath, American Yellow, Sugar of Metz, Knevett's Giant, Prince of Wales, Nonpariel, Brinckle's Orange, Phœnix, Elvira, Fanny, Royal, Mary, Saunder's Large Red, Lady Anne, Sharpe, Pauline, Herrenhaus, Red Perpetual, Battler's Giant, Sir John, Carleton, Empire, All Summer, Cariboo Wild and Columbia.

BLACK CAP.

Name.	Date of Ripening.	Growth.	Size of.	Quality.	Productiveness.
Lovett	July 4	Vigorous	Medium	Good quality, firm	Productive.
Older	" 4	"	Large	"	"
Palmer	" 5	"	Above medium	"	"
Kansas	" 6	"	Medium	"	"
Cromwell	" 8	"	"	"	"
Ada	" 9	"	Above medium	"	"
Gregg	" 10	"	Large	Very good quality	"
Progress	" 10	"	Medium large	Sweet and good quality, firm.	"
Jackson's May King	" 10	"	Medium	Good quality, firm	"

The following varieties are thrifty, but did not fruit this year: Nemaha, Lotta, Mamm. Cluster, Smith's Prolific, and Hopkins.

STRAWBERRIES.

The first part of the strawberry season was favourable. The plants were strong and healthy, and the crop good, but after the second picking, we had long continued warm heavy rains, which spoiled at least half of the remaining crop, as the berries were too soft for shipping.

STRAWBERRIES—VARIETIES FRUITED.

Name.	Date of Ripening.	Growth of Plant.	Size of Berry.	Quality.	Productiveness.
Hautbois	June 1	Fairly vigorous.	Small medium	Sweet; fairly good flavour; soft.	Not productive.
Daisy	" 1	Vigorous	Large	Good flavour; firm; stem stout, but not strong.	
Smith's Seedling	" 2	"	Medium	Insipid and rather soft; stem strong.	Fairly productive.
Philip's Seedling	" 3	"	Large; irregular in shape.	Not very good quality; stem stout.	Productive.
Omega	" 3	"	Large	Good flavour; firm; stem long and fairly strong.	"
Chairs	" 3	"	" medium	Good flavour; firm, and continues long in bearing.	"
Van Deman	" 3	"	" "	Fine flavour and good shipper	"
Warfield	" 4	"	Above "	Very good flavour; firm; continues long in bearing.	"

STRAWBERRIES—VARIETIES FRUITED.

Name.	Date of Ripening.	Growth of Plants.	Size of Berry.	Quality.	Productiveness.
Beder Wood....	June 4	Moderately vigorous.	Large medium..	Good flavour..................	Productive.
Alexander II....	" 4	Fairly vigorous.	Medium........	Very good flavour............	Moderately productive.
Madame Joseph Deboise.	" 5	Vigorous ...	Large	Of good flavour, but not firm; stem slender.	Productive.
Iowa Beauty....	" 5	" ...	" medium ..	Good quality; firm.....	"
Maxwell.,.. ...	" 6	" ...	Medium..	Fairly good flavour; stem strong and fairly long.	"
Alpha..........	" 7	" ...	"	Good quality..................	"
Parker Earle....	" 7	" ...	Large	"	Largest crop of al our berries this year.
Beebe's Seedling, No. 3.	" 7	" ...	"	Good flavour and firm.........	Not very productive.
Beebe's Seedling, No. 2.	" 8	" ...	"	" "	" "
Sir Joseph Paxton.	" 8	" ...	Medium to large.	Fairly good flavour; stems long and rather slender.	Not productive.
Dr. Hogg.....	" 8	" ...	Rather small....	Sweet; pleasant flavour.... ..	" "
Brandywine	" 8	" ...	Large	Good flavour; firm.....	" "
Imp. Jucunda...	" 8	" ...	Above medium..	Bright red berry of good flavour; firm, and long, strong stem.	Productive.
Eleanor	" 8	" ...	Medium........	Sweet; stem weak............	Fairly productive.
Arrow..........	" 8	" ...	Large medium..	Rather sweet; good flavour; firm	" "
Eclipse.........	" 8	" ...	Ir'gular in shape; medium.	Good flavour............	Productive.
Weston.	" 9	" ...	Large & irregular in shape.	Acid, but of good flavour; stem short and strong.	"
Mary	" 9	" ...	Large	Good flavour; a little acid; stem medium in length and weak.	Not very productive.
Anna Kennedy..	" 9	" ...	Medium........	Medium in flavour; firm.......	Fairly productive.
Beverly	" 9	" ...	Above medium..	Good quality; fairly firm.....	Productive.
Tennessee	" 9	Feeble.....	Small	Inferior quality...............	Not productive
Empress Eugenie	" 10	Moderately vigorous.	Large medium..	Good flavour..................	Fairly productive.
Bonny Lass. ..	" 10	Vigorous ...	Medium to large.	Good flavour, but irregular in shape.	Productive.
Lovett's Early ..	" 10	" ...	Small to medium	Fair flavour; stem long and strong.	Not productive.
Michigan.	" 10	" ...	Large	Good flavour..................	" "
	" 10	Feeble......	Small.....	Inferior berry.................	" "
Tubbs	" 11	Fairly vigorous.	Large medium..	Fair flavour, but rather soft; stem short and medium strong.	Fairly productive
Eisel I....... ...					
Windsor Chief...	" 12	Vigorous ...	Above " ..	Acid, but of good flavour; stem strong; stands up well.	" "
Yale	" 12	" ...	Medium.	Acid; not very good flavour; seedy	Not productive.
Pine Apple.....	" 12	" ...	" to large.	Mild and insipid in flavour; stem strong and long.	Productive.
H. W. Becher..	" 12	" ...	Large medium..	Fine flavour and firm....	Not productive.
Greenville	" 13	" ...	Above " ..	A firm, handsome bright red berry; of good flavour; long, strong stems.	Productive.
Timbrel	" 13	Not very vigorous.	Large " ..	Good flavour and firm.........	Not very productive.
Laxford Hall....	" 16	Feeble......	Small to medium	Poor flavour; many imperfect berries.	Not productive.

METEOROLOGICAL RECORD.

—	Date of Highest Temperature.	Degrees	Date of Lowest Temperature.	Degrees	Rain-fall.	Snow-fall.	Sun-shine.
1896.					Inches.	Inches.	H. M.
December	10th	53	16th	22	10·70	None.	19 18
1897.							
January	11th, 20th, 22nd and 31st	50	27th	18	5·74	4½	59 24
February	26th	61	17th	29	1·61	6	41 18
March	31st	57	11th	10	5·31	26	108
April	16th	85	3rd	32	3·12	None.	118 18
May	26th	93	23rd	28	4·42	"	225 18
June	27th	84	18th, 23rd	40	12·06	"	114 18
July	31st	85	31st	43	4·58	"	198 36
August	16th	97	22nd	40	1·13	"	283 18
September	24th	89	27th	32	6·50	"	140 48
October	6th	78	14th	30	6·23	"	128 30
November	1st	67	28th	10	4·55	9	36 54
					65·95	45½	1,474
Totals for 1896					63·47	75½	1,417 27

I have the honour to be, sir,

Your obedient servant,

THOS. A. SHARPE.

STATEMENT OF EXPENDITURE ON THE DOMINION EXPERIMENTAL FARMS, FOR THE YEAR ENDING 30th JUNE, 1897.

CENTRAL EXPERIMENTAL FARM—EXPENDITURE, 1896-97.

Live stock	$ 144 27
Feed for stock, including veterinary services	699 25
Seed grain, seeds, trees, &c.	1,273 25
Implements, tools, hardware and supplies	890 99
Drainage and drain tiles	88 06
Manure and fertilizers	477 57
Travelling expenses	1,340 92
Exhibition expenses	1,061 50
Blacksmithing, harness supplies and repairs	443 11
Bee supplies	177 62
Salaries	1,842 57
Wages, farm work, including experimental work with grain and other farm crops; also, salaries of farm foreman and Director's assistant in experimental work	5,836 31
Wages, care of stock	2,446 49
Chemical department	762 88
Botanical and entomological department	1,128 28
Horticultural department	4,300 43
Poultry department	1,558 19
Forestry department and care of grounds	1,791 15
Arboretum	849 65
Office help, correspondence branch and messenger service	2,948 86
Printing and stationery	648 41
Seed testing and care of greenhouses	876 02
Dairy department	741 99
Museum	26 94
Contingencies	375 42
" books and newspapers	212 86
" telegrams and telephones	152 40
	$ 33,095 39

EXPERIMENTAL FARM, NAPPAN, N.S.—EXPENDITURE, 1896-1897.

Live stock	$ 6 75
Feed for stock, including veterinary services	100 15
Seed grain, seeds, trees, &c.	154 53
Implements, tools, hardware and supplies	228 78
Draining and drain tiles	97 80
Manure and fertilizers	252 04
Travelling expenses	148 46
Exhibition expenses	163 98
Blacksmithing, harness supplies and repairs	62 42
Salaries, including proportion of salaries for general work, Ottawa	3,194 84
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	1,635 39
Wages, care of stock	700 20
Chemical department	445 02
Botanical and entomological department	411 25
Poultry department	3 55
Forestry department, including care of grounds	243 80
Office help	
Seed grain distribution	276 74
Contingencies (including postage, $32.04)	49 22
" printing and stationery	25 43
" books and newspapers	3 50
" telegrams	
	$ 8,203 85

EXPERIMENTAL FARM, BRANDON, MANITOBA—EXPENDITURE, 1896-97.

Live stock	$ 347 35
Feed for stock, including veterinary services	57 95
Seed grain, seeds, trees, &c	219 21
Implements, tools, hardware and supplies	366 04
Draining	8 00
Travelling expenses	121 10
Exhibition expenses	218 80
Blacksmithing, harness supplies and repairs	251 40
Salaries, including proportion of salaries for general work, Ottawa	2,474 84
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	3,476 99
Wages, care of stock	636 50
Chemical department	445 02
Botanical and entomological department	411 25
Forestry department, including care of grounds	281 50
Poultry department	55 40
Office help (including delivery of mail, $111)	392 69
Seed grain distribution	750 38
Tree distribution	211 03
Contingencies, (including postage, $33.06)	195 13
" printing and stationery	101 28
" books and newspapers	21 85
" telegrams and telephones	40 12
	$ 11,083 83

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.—EXPENDITURE, 1896-97.

Live stock	$ 14 25
Feed for stock, including veterinary services	30 10
Seed grain, seeds, trees, &c	242 20
Implements, tools, hardware and supplies	626 54
Manure and fertilizers	
Travelling expenses	13 90
Exhibition expenses	34 00
Blacksmithing, harness supplies and repairs	214 65
Salaries, including proportion of salaries for general work, Ottawa	2,474 84
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,953 88
Wages, care of stock	1,178 62
Chemical department	445 02
Botanical and entomological department	411 25
Poultry department	79 37
Forestry department, including care of grounds	378 00
Office help	493 80
Seed grain distribution	493 20
Tree distribution	262 16
Contingencies, (including postage, $88.28)	182 95
" printing and stationery	47 06
" books and newspapers	4 00
" telegrams	3 83
	$ 10,583 62

EXPERIMENTAL FARM, AGASSIZ, B.C.—EXPENDITURE, 1896-97.

Live stock	
Feed for stock, including veterinary services	$ 117 18
Seed grain, seeds, trees, &c	212 84
Implements, tools, hardware and supplies	260 69
Draining and drain tiles	
Manure and fertilizers	61 13
Travelling expenses	44 40
Exhibition expenses	90 90
Blacksmithing, harness supplies and repairs	87 64
Salaries, including proportion of salaries for general work, Ottawa	2,474 84
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,257 10
Wages, care of stock	443 25
Chemical department	445 02
Botanical and entomological department	411 25
Poultry department	16 40
Forestry department	52 50
Office help	100 00
Seed grain distribution	129 78
Tree distribution	7 69
Clearing land	805 30
Contingencies (including postage, $58.14)	106 76
" printing and stationery	23 59
" books and newspapers	23 50
" telegrams	2 95
	$ 8,174 71

SUMMARY.

Central Experimental Farm		$ 33,095 39
Nappan "		8,203 85
Brandon "		11,083 83
Indian Head "		10,583 62
Agassiz "		8,174 71
Seed grain distribution		3,532 15
Forest tree and tree seed distribution		109 54
Printing bulletins and distribution of bulletins and reports	$ 4,216 91	
Less special sum in estimates for this item	4,000 00	
		216 91
		$ 75,000 00

Special vote to replace chemical apparatus and supplies destroyed by fire in the laboratory	$ 1,000 00

SUMMARY OF STOCK, MACHINERY, IMPLEMENTS, &c., ON HAND 31st DECEMBER, 1897.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

15 Horses	$ 1,065 00
3 Ayrshire cattle	130 00
3 Guernsey "	550 00
4 Jersey "	200 00
7 Canadian "	200 00
14 Grade "	323 00
3 Yorkshire swine	60 00
3 Berkshire "	70 00
3 Tamworth "	60 00
5 Poland China swine	78 00
2 Chester white "	40 00
14 Grade swine	80 00
Farm machinery	1,849 00
Farm implements	644 50
Vehicles, including farm wagons and sleighs	810 00
Hand tools, hardware and sundries	1,033 00
Harness	314 55
Dairy department, machinery, &c	832 00
Horticultural department, implements, tools, &c	281 90
Forestry " "	419 70
Botanical " "	7 00
Poultry " 241 fowls	261 00
" " implements, furnishings, &c	83 50
Bees and apiarian supplies	259 30
Chemical department, apparatus and chemicals	2,133 95
Books in several departments	333 58
Greenhouse plants, supplies, &c	1,138 50
Office furniture and stationery	1,301 00
Furniture at Director's house	1,270 00
	$ 15,828 48

EXPERIMENTAL FARM, NAPPAN, N.S.

6 Horses	$ 400 00
3 Guernsey cattle	605 00
2 Holstein "	100 00
2 Ayrshire "	320 00
27 Grade "	1,073 00
2 Yorkshire swine	35 00
3 Berkshire "	21 00
2 Tamworth "	28 00
8 Grade "	30 00
46 Fowls	31 00
Vehicles, including farms wagons and sleighs	365 00
Farm machinery	475 00
" implements	198 00
Hand tools, hardware and sundries	296 75
Harness	126 10
Furniture for office, reception room, and bedroom for visiting officials	274 78
	$ 4,377 63

EXPERIMENTAL FARM, BRANDON, MANITOBA.

10 Horses	$	750 00
3 Ayrshire cattle		175 00
2 Durham "		150 00
5 Holstein "		250 00
10 Grade "		215 00
1 Chester White swine		15 00
3 Tamworth "		48 00
2 Berkshire "		38 00
60 Fowls		55 50
Bees and apiarian supplies		70 20
Vehicles, including farm wagons and sleighs		500 00
Farm machinery		996 00
" implements		565 00
Hand tools, hardware and sundries		623 09
Harness		215 50
Furniture for reception room and bedroom for visiting officials		154 55
supplies and books for office		192 40
	$	5,013 24

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

14 Horses	$	1,665 00
1 Ayrshire		75 00
8 Durham cattle		585 00
1 Polled Angus		75 00
15 Holstein cattle		760 00
16 Grade cattle		440 00
15 Yorkshire swine		163 00
4 Berkshire "		61 00
17 Tamworth "		130 00
4 Grade "		43 00
115 Fowls		115 00
Bees and apiarian supplies		36 50
Vehicles, including farm wagons and sleighs		510 00
Farm machinery		1,314 00
" implements		682 50
Hand tools, hardware and sundries		448 40
Harness		210 75
Furniture for reception room and bedroom for visiting officials		251 50
" supplies and books for office		203 15
	$	7,768 80

EXPERIMENTAL FARM, AGASSIZ, B.C.

6 Horses	$	800 00
5 Durham cattle		390 00
6 Ayrshire "		300 00
6 Holstein "		450 00
2 Grade "		40 00
6 Dorset horned sheep		60 00
2 Berkshire swine		50 00
2 Tamworth "		50 00
53 Fowls		46 00
Bees and apiarian supplies		35 95
Vehicles, including farm wagons		250 00
Farm machinery		600 00
" implements		205 50
Hand tools, hardware and sundries		207 00
Harness		100 50
Furniture for reception room and bedroom for visiting officials		251 00
" supplies and books for office		100 00
	$	3,935 95

W. H. HAY,
Accountant.

INDEX.